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PHARMACOLOGY.—*The relationship between time of administration and effectiveness of remedies for cyanide poisoning.*[1] JAMES F. COUCH, H. BUNYEA, and A. B. CLAWSON, Bureau of Animal Industry.

In the studies previously reported[2] it appeared that promptness in administration of the remedy in cyanide poisoning was an important factor in protecting the animal against a fatal outcome. Data as to just how soon the remedy must be given were lacking, however, and it was with the idea of supplying some definite information on this point that the experiments reported in this paper were conducted. We had previously shown that the combination of sodium nitrite and sodium thiosulphate is the most effective remedy for cyanide poisoning in both cattle and sheep, and that it is possible to protect against

TABLE 1.—EFFECT OF VARYING INTERVAL BETWEEN DRENCHING WITH 1.5 M.L.D. OF CYANIDE AND GIVING THE REMEDY

Date 1934	Sheep No.	Weight kg	Time from end of drench to first symptoms	Time from end of drench to collapse	Time from end of drench to giving remedy	Remedy	Effect
Aug.			min.	min.	min.		
29	1493	43.6	1	1.5	11.5	1g nitrite & 2g thiosulphate	Died
29	1537	45.9	1.5	1.75	7.5	do	Died
29	1487	39	0.5	2	12	do	Survived
29	1485	39	1	2.5	12.5	do	Died
29	1480	34.45	1	2	3	do	Survived
29	105A	39.5	1	1.5	9.5	do	Died
29	1509	43.1	1.5	1.75	8.75	do	Died
29	1488	45.45	1.5	3	8	do	Died
30	1467	40.8	1	1.5	32.5	do	Survived
30	1479	41.2	2	4	18.5	do	Survived
30	1482	31.7	1.5	2.5	4	do	Survived
30	1526	37.5	1.5	3	5	do	Died
30	100A	35.8	1.5	2	6	do	Died
30	101A	34.9	1	2	7	do	Died
30	1519	35.8	1	3	5	do	Died
30	1484	36.2	1	2	5	0.5 g methylene blue	Died
30	103A	34.9	1.5	2	7	do	Died
30	1500	39.9	1	2	7	do	Died
30	1466	48.07	1	2	4	do	Died

[1] Received January 3, 1935.
[2] This JOURNAL 24: 369–385, 528–532. 1934.

2 m.l.d. of potassium cyanide in cattle and 2.75 m.l.d. in sheep. It remained to determine how soon after the cyanide was given the remedy must be injected in order that the animal might survive. This paper records only the results obtained with sheep.

The results are summarized in table 1. Nineteen experiments were performed with sheep of which 15 were given 1g of sodium nitrite and 2g of sodium thiosulphate in water solution, and four were given 50 c.c. each of 1 per cent methylene blue solution for comparison. As previously described the potassium cyanide was given by mouth. The dose of cyanide given was calculated to equal 1.5 m.l.d. or just high enough to ensure death in all cases and yet much smaller than the upper limit of possible protection (2.75 m.l.d.). The remedy was administered intraperitoneally at varying times following the completion of the drenching. The animals exhibited the first symptoms, accelerated respiration, in from ½ to 2 minutes after the drench, averaging 72 seconds, and collapsed in 1.5 to 4 minutes after the drench averaging 132 seconds. Dyspnea was present in all cases at the time the remedies were injected and was very marked in the delayed cases.

Three cases were encountered in which the course of the poisoning was atypical. Sheep No. 1487 after showing symptoms in ½ minute and collapsing in 2 minutes after the drench, showed improvement, recovered consciousness, rolled upon the sternum and remained there. Six minutes later the sheep began to show dyspnea and one minute after was breathing with considerable difficulty. She was then given the combination remedy 12 minutes after the drench. Forty-eight minutes after the injection of the remedy she rose to her feet and shortly appeared fully recovered.

Sheep No. 1467 behaved similarly. After collapsing the sheep remained down for 1.5 minutes and then got to her feet and remained standing for 20 minutes before lying down. The animal developed symptoms of dyspnea and 32.5 minutes after the drench was very sick. She was then given the remedy and improved, got on her feet in 51 minutes and recovered. Sheep No. 1479 likewise got to her feet after collapsing and remained standing for 6 minutes when she went down and became dyspneic. In 18.5 minutes after the drench the sheep was very sick. She was given the remedy, got back on her feet in 21 minutes and recovered.

In the other cases more regularity was observed. There was a progressive development of symptoms without periods of improvement before the remedy was injected. When 3 and 4 minutes only had elapsed

between the completion of the drench and the administration of the nitrite-thiosulphate combination the sheep recovered. A longer interval was followed by death. As methylene blue has been recommended as a remedy, for purposes of comparison 4 sheep were treated with 50 c.c. of 1 per cent solution intraperitoneally at 4, 5, 7, and 7 minutes after the completion of the drench and all died.

SUMMARY

The combination of 1 gram sodium nitrite and 2 grams of sodium thiosulphate used as a remedy in cyanide poisoning is effective when administered promptly. The combination protected when injected intraperitoneally within 4 minutes after drenching an average sized sheep with 1.5 m.l.d. of potassium cyanide, but did not protect after a longer interval except in the cases of unusually resistant sheep. One half of a gram of methylene blue in solution similarly administered did not protect in 4 minutes. Three sheep out of 19 showed atypical behavior when poisoned with the cyanide.

ZOOLOGY.—*A new species of* Oochoristica *from a skunk.*[1] MARY SCOTT SKINKER, Bureau of Animal Industry. (Communicated by E. W. PRICE.)

Members of the genus *Oochoristica* are found in a wide range of vertebrate hosts, but they occur most frequently in reptiles. Meggitt (1934) gave a comparative table of most of the species of the genus; he did not include 5 species described by Harwood (1932) or *O. parva* (Sandground, 1926) Meggitt, 1934. He explained that the omission of *O. parva* was due to the fact that no description was available, and it is probable that none was available for the species described by Harwood. The description of *O. thapari* Johri, 1934 from *Calotes* sp. has been published since Meggitt's paper appeared. Of the species included in Meggitt's table, 5 (including *O. parva*) are from carnivore hosts. These 5 species and the one described in this paper represent the known species from carnivores; a comparative table of these is included.

Family ANOPLOCEPHALIDAE Cholodkowski, 1902
Subfamily LINSTOWINAE Fuhrmann, 1907
Genus OOCHORISTICA Luehe, 1898

Generic diagnosis.—Genital pores usually unilateral, only infrequently irregularly alternating. Genital ducts passing between or dorsal to longitudinal excretory vessels. Longitudinal excretory vessels variable in number,

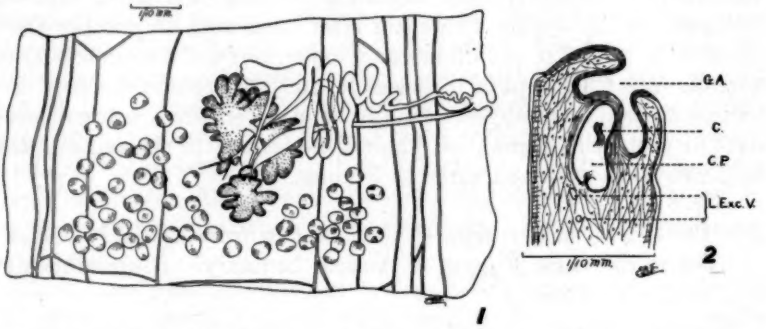
[1] Received November 6, 1934.

frequently with secondary ramifications. Testes numerous, i.e., usually more than 10. Female reproductive organs median; uterus a transverse tube breaking up into egg capsules, each containing a single egg. Adults in primates, carnivores, insectivores, edentates, marsupials, and reptiles; larval stages unknown.

Oochoristica mephitis, n. sp.

Scolex.—Maximum diameter 429 to 689μ; suckers usually somewhat longer than wide; only rarely circular in outline, 159 to 220μ long by 130 to 183μ wide.

General anatomy of strobila.—Length of gravid strobila 11 to 25 mm.; width usually variable, up to 1.3 mm. Neck (unsegmented region) present or absent according to state of contraction, if present usually only slightly



Figs. 1–2.—*Oochoristica mephitis.* Fig. 1.—mature segment. Fig. 2.—Region of genital atrium. Drawn from cross section. C., cirrus; C. P., cirrus pouch; G. A., genital atrium; L. Exc. V., longitudinal excretory vessel.

narrower than greatest diameter of scolex. Segments about 40 to 70 in number in strobilae with fully developed oncospheres; immature segments 20 to 40 in number, the posterior 5 to 10 segments showing only testes (i.e., ovary not yet developed); fully mature segments 2 to 10 in number, usually about 3, these usually widest of strobila; gravid segments 7 to 23 in number, usually narrower than mature segments and usually longer than wide, sometimes approximately square; in a specimen 11 mm. long, gravid segments 715μ square. Genital papillae about one-third segment length from anterior margin in mature segments, usually in middle of segment margin in gravid segments. Genital atrium (Fig. 2) conspicuous, variable in shape, usually about 35 to 40μ in greater diameter. Longitudinal excretory canals inconspicuous and difficult to demonstrate in whole mounts, variable in number and arrangement, usually 4 to 6 (Fig. 1) on each side, most laterally situated canals usually about 110μ from segment margin; transverse canals irregular in arrangement (Fig. 1) but tending to form a somewhat definite posterior canal in each segment. Longitudinal muscular layer poorly developed; transverse muscles scattered, few in number. Calcareous corpuscles few in the material available.

Male reproductive system.—Testes 44 to 77 in number, sometimes slightly oblong, size varying with stage of development, actively functioning testes up to about 40μ in greater diameter, distributed posterior and lateral to

ovary with tendency toward distribution in two groups in mature segments, poral group smaller, testes not extending laterad beyond most lateral excretory canal. Cirrus pouch usually extending nearly to most lateral longitudinal excretory canal, usually approximately spherical, 55 to 65μ in diameter, sometimes slightly greater in the diameter which lies along transverse axis of strobila. Vas deferens without coils in early development, in wide coils in mature segments, sometimes disappearing abruptly in early gravid segments, usually still visible in terminal segments, passing along the middle of ventral surface of ovary.

Female reproductive system.—Ovary at first distinctly bilobed, later variable in shape, but with tendency toward crescentic outline. Oviduct (Fig. 3) passing from middle of posterior margin of ovary to vagina, surrounded

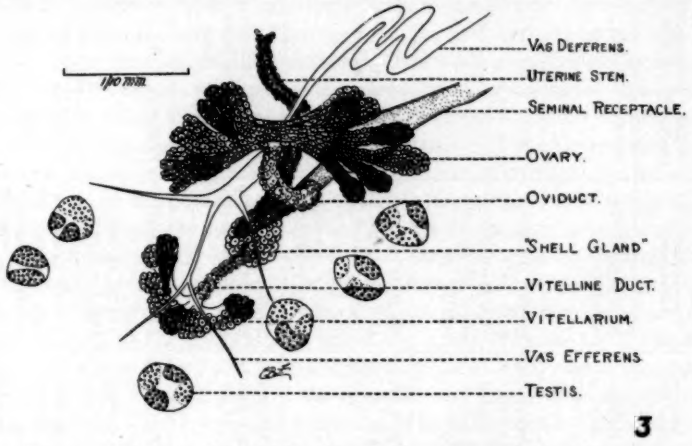


Fig. 3.—*Oochoristica mephitis.* Details of median reproductive organs. Ovary not fully developed.

by large nucleated cells. Vitellarium at first crescentic in outline, later usually irregular in outline, composed of numerous lobules made up of cells slightly smaller than those of ovary; vitelline duct surrounded by large nucleated cells. "Shell gland" (Fig. 3) approximately globular in shape, composed of (or surrounded by?) large cells. In a gravid specimen 11 mm. long with about 40 segments, other measurements as follows: Typical mature segment 1.23 mm. wide by 0.65 mm. long; ovary about 192μ long and 192μ wide; shell gland about 40μ in diameter; vitellarium about 92μ in diameter. Ovary not developing until after testes are well developed; ovary then developing rapidly and disappearing abruptly at appearance of first eggs in uterus. Uterine stem passing from "shell gland" along longitudinal axis of segment to a point approximately parallel to anterior edge of ovary, surrounded by relatively large nucleated cells; with further development, uterine stem (Fig. 3) bifurcating anteriorly and forming a transverse tube, the tube eventually breaking down and egg capsules filling entire segment. Vagina without coils, opening posterior to opening of cirrus sac. Seminal receptacle conspicuous, about 145μ to 185μ long by 43μ to 50μ in maximum width, dorsal to poral lobe of ovary, frequently visible along with vas def-

TABLE 1.—THE SPECIES OF OCHORISTICA FOUND IN CARNIVORES

Species	Length (in mm.)	Width (in mm.)	Diameter of scolex (in μ)	Diameter of suckers (in μ)	Length of cirrus pouch (in μ)	Extent of cirrus pouch	Testes, number and arrangement	Seminal receptacle	Diameter of egg (in μ)	Relation of genital ducts to excretory vessels	Hosts and locality
amphisbeteta Meggitt, 1924	15–40	0.45–0.50	210	165	111	Beyond lateral excretory vessel	22–24; posterior to ovary	Absent	30	Between; dorsal to nerve	*Herpestes auropunctatus* (Hodgson, 1836); India.
herpestis Kofend, 1917	60	3	290	—	220	To ventral excretory vessel	50–60; posterior and lateral to ovary; in 2 layers dorsoventrally	—	57×32	Dorsal	*Herpestes sanguineus* Rüpp.; Africa (Soudan). *Atelerix spiculus* (Thomas and Wroughton, 1907), *A. spinifex* Thomas, 1918; Africa (Nigeria).
ichneumontis Baer, 1924	100	4	—	—	200	To nerve	99–100; posterior and lateral to ovary, extending beyond excretory vessels; in single layer	Absent	46 (oncosphere 30)	Dorsal	*Herpestes gracilis* (Rüpp.) *Galerella gracilis* (Ruppell, 1835); Union of South Africa. "*Foetorius* sp." [? Ictonyx sp.]; Africa (Rhodesia).
incisa Railliet, 1899	10–150	1.3	270–600	80–120	100–130	(No drawing available)	23–50; posterior and lateral to ovary	Small	30 (oncosphere 23μ)	Between	*Meles meles* (Syn. *M. tazus* Schreb.); Europe (France). *Crocidura caerulea* (Kerr, 1792); Asia.
mephitis n. sp.	11–25	1.3	429–689	159–220 by 130–183	55–65	To lateral excretory vessel	44–75; posterior and lateral to ovary, in one irregular layer.	Present	30	Dorsal	*Mephitis elongata;* United States (Georgia).
parva (Sandground, 1926) Meggitt, 1934	1.3–10.6	650–750	750	140	90	Beyond lateral excretory vessel	40–60; posterior and lateral to ovary; several between vagina and vas deferens	Present	24×21	Dorsal; ventral to nerve	*Nasua socialis;* Brazil.

erens in terminal gravid segments. Eggs, when containing fully developed oncospheres, about 30μ in diameter.

Hosts.—Definitive: *Mephitis elongata;* intermediate: Unknown.
Location.—Small intestine of definitive host.
Distribution.—United States (Georgia).
Type specimen.—United States National Museum No. 32859, collected by Dr. Eloise Cram of the Zoological Division.

Specific differentiation.—The present writer considers the number and arrangement of testes, the size of the cirrus pouch and its position with reference to the other genital organs and especially to the excretory canals and nerve, the presence or absence of a seminal receptacle, the type of genital atrium, i.e., whether massive or with relatively little musculature, the relative position of the genital ducts and excretory canals, and the size of the egg the best characters for specific differentiation. *Oochoristica mephitis* may be separated from the other members of the genus by comparison of the species with regard to these characters as shown in Meggitt's table. In some cases such as *O. cryptobothria* (Linstow, 1906) La Rue, 1911 the description is so inadequate as to prevent comparison, but where relatively complete descriptions are given, one or more of the characters listed above will serve to separate all species from *O. mephitis.* The accompanying table gives only the species found in carnivores, and in it *O. mephitis* may be distinguished from *O. amphisbeteta* and from *O. ichneumontis* on the basis of the presence of a seminal receptacle in *O. mephitis;* in *O. amphisbeteta* the testes are distributed lateral to the most lateral excretory canal, whereas in *O. mephitis* no testes lie outside the most lateral excretory canal. *O. herpestis* is a much larger worm than *O. mephitis* and the eggs also are larger. The conspicuous seminal receptacle in *O. mephitis* separates it from *O. incisa* which, according to Baer (1927), has only a very small one, and in *O. incisa* the genital ducts pass between the excretory vessels, while in *O. mephitis* they pass dorsal to the excretory vessels. *O. parva* may be distinguished from *O. mephitis* by the testes in the former having a distribution (see table 1) quite unlike that in the latter, and by the cirrus pouch in the former extending well past the excretory vessels; the musculature of the genital atrium of the former also serves to differentiate it from other species. Meggitt (1934) pointed out that the number of testes and the size of the cirrus sac vary, and should, therefore, be regarded as not infallible specific characters. The present writer finds that an accurate count of testes can be made only in young segments before the testes have developed to a size which results in crowding. In *O. mephitis* the writer does not find the variation in the size of the cirrus pouch greater than the normal limits of variation for such a character. It is, therefore, considered a relatively constant character. Meggitt cautioned against accepting unquestioningly the measurements of eggs and oncospheres since they vary according to the medium in which the eggs are measured. The measurements here given are for eggs mounted in balsam.

The characteristic appearance of these specimens is that of thin, nearly translucent worms, with the width usually greatest in the region of the mature segments, and the transition from mature segments to gravid segments so rapid as to seem abrupt.

Discussion of table 1.—Meggitt (1934) considered *O. amphisbeteta* Meggitt, 1924 a synonym of *O. erinacei* Meggitt, 1920, but in the opinion of the present writer both these specific names are probably synonyms of *O. incisa* Railliet, 1899. Joyeux (1927) considered *O. incisa* very similar to *O. erinacei* and described the egg capsules of *O. erinacei* var. *rodentium* as 45μ in diameter with the oncosphere 23μ by 17μ. Marotel (1899) described the egg capsules of *O. incisa* as 45μ in diameter and the egg itself as 35μ by 22μ with the hooks of the embryo as 17μ long. Meggitt (1934) did not give the egg size of either *O. erinacei* or *O. amphisbeteta*. Baer (1927) gave the diameter of the eggs of *O. erinacei* as 15μ, and that of the eggs of *O. amphisbeteta* as 30μ. With such conflicting data it is difficult to come to any conclusion other than that the measurement "15μ" given by Baer is probably a typographical error. The number of testes recorded by Meggitt (1924) for *O. amphisbeteta* is 22 to 24 and for *O. erinacei* is 30 to 50, but it is probable that these were counted in mature segments only, and judging from the variation found by the present writer in young segments of *O. mephitis* in which the testes could be accurately counted, variations from 22 to 50 is not beyond specific limits. It is on the authority of Baer (1927) that *O. amphisbeteta* is described as being without a seminal receptacle and *O. incisa* as having a small one. It seems quite possible, since Meggitt fails to state definitely that the seminal receptacle is absent in *O. amphisbeteta*, that a small one may be present but demonstrable only in sections or in well extended segments. However, Meggitt described *O. erinacei* as being without a seminal receptacle, and since he later came to regard *O. amphisbeteta* as a synonym of *O. erinacei* for the present both species must be considered as lacking this structure.

The specimens of *O. incisa* which were but 10 mm. long were regarded by Baer as a *forma minor*.

The massive musculature of the genital atrium of *O. parva* (Sandground, 1926), Meggitt, 1934, appears to be a specific character which would serve to separate this species from other members of the genus. The specific name *parva* was proposed by Baylis (1929) for a member of the genus *Oochoristica*, but when *Atriotaenia parva* Sandground, 1926 was identified as belonging to the genus *Oochoristica*, it created the necessity of renaming *Oochoristica parva* Baylis, 1929. Dr. Baylis has suggested, in correspondence which the present writer had with him, that if necessary *Oochoristica parva* Baylis, 1929 be renamed *Oochoristica lygosomatis*, and he indicated his willingness to have the new name published by anyone in a position to express a definite opinion that Sandground's species is a member of the genus *Oochoristica*. Since *Oochoristica parva* (Sandground, 1926), Meggitt, 1934 possesses no

characters which serve to separate it from the genus *Oochoristica*, the present writer proposes the new name *O. lygosomatis* for *O. parva* Baylis, 1929.

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ZOOLOGY.—*A new species of amphipod of the genus* Grandidierella *and a new record for* Melita nitida *from Sinaloa, Mexico.*[1] CLARENCE R. SHOEMAKER, U. S. National Museum. (Communicated by MARY J. RATHBUN.)

In 1923 Mr. W. E. Chapman, American Consul, at Mazatlan, Sinaloa, Mexico, sent some amphipods to the U. S. National Museum which were taken by Mr. Harry Notton in connection with the shrimp investigations which he was carrying on at Mazatlan. The material contained two species, *Melita nitida* Smith, which is reported for the first time from the west coast of America, and a species that I believe to be new to science and which I designate as *Grandidierella nottoni.*

GRANDIDIERELLA Coutière, 1904

The first species of this genus, when described by Giles in 1888, was placed in the genus *Microdeutopus* with which it, however, did not agree by the possession of a uniramous third uropod. Coutière in 1904, when he described his new species, *mahafalensis*, created the genus *Grandidierella* to receive it, and considered its affinities closer to the *Corophiidae*, in which family he placed it. Coutière, and later Stebbing in 1908, called attention to the close alliance of *Grandidierella* with both *Unciola* and *Chevreuxius*, and Stebbing placed his new species, *G. bonnieri*, in the *Corophiidae*. Chilton (1921, p. 549) said, "The

[1] Published by permission of the Secretary of the Smithsonian Institution. Received December 8, 1934.

general resemblance of the animals to *Microdeutopus* and to *Aora* is so great that in my opinion the genus should be placed under the *Aoridae*. The third uropods certainly are one-branched, but I do not consider this sufficient to outweigh the resemblance in all other characters which, as will be seen from the following description, is very close." He lays particular stress upon the resemblance of the first gnathopods of the male, the uropods, and the telson to those of *Microdeutopus*. Schellenberg (1925, p. 164) calls attention to the very indefinite limits of the family *Corophiidae* as established by Stebbing in *Das Tierreich*, and suggests the alteration of the family *Aoridae* to include genera with either biramous or uniramous third uropods in order to include the genus *Grandidierella*.

In comparing *Grandidierella* with the genera now placed under the *Corophiidae*, there appear to be so many characters in common that it seems more natural to include it in this family rather than to alter the *Aoridae* for its reception. *Grandidierella* is depressed, possesses a very strongly developed second antenna in the male, has very small side-plates which are not in continuity, and has the third uropods uniramous. These characters are very strongly emphasized in *Grandidierella elongata* Chevreux (1925, p. 393, fig. 32) and in the present species, and are also possessed by the genera *Corophium*, *Unciola*, and *Siphonoecetes*. *Chevreuxius*, *Ericthonius*, *Neohela*, *and Unciolella* are depressed with small disconnected side-plates, and have uniramous third uropods, but without the strongly developed second antenna. *Camacho* is depressed and has the small disconnected side-plates, but has a minute second ramus to third uropods. *Cerapus* is depressed, has the separated side-plates, and uniramous third uropods, but has the first antennae strongly developed. In the genera *Cerapus*, *Corophium*, *Ericthonius*, and *Siphonoecetes*, the second gnathopods are larger than the first, but in *Neohela*, *Unciola*, *Chevreuxius*, and *Unciolella* the first gnathopods are larger than the second. In the genera *Chevreuxius*, *Unciolella*, and *Grandidierella* the first gnathopod of the male is strongly developed and very similar in structure, the fifth joint being enlarged with a short, transverse palm defined by a strong tooth at the lower distal extremity. The second gnathopods in these three genera are very similar in structure, being weak, slender, and subchelate. In the species of *Grandidierella* here described, besides other points of resemblance, the fifth or last peraeopod and the second antenna of the male bear a very close resemblance to *Corophium;* the fourth and fifth joints of this antenna bearing the characteristic distal tooth of that genus.

Chevreux (1925, p. 392), when describing his species, *G. elongata*, placed it in the family *Corophiidae*.

In view of the foregoing considerations, it would seem more natural to place *Grandidierella* with other closely related genera in the family *Corophiidae* rather than alter the characters of the family *Aoridae* to accommodate it.

Grandidierella nottoni, n. sp.

Male.—Head with lateral lobes well developed and bearing the ill defined, black eye. Antenna 1 with first joint stouter, but a little shorter than second, third joint about one-third the length of second, flagellum nearly

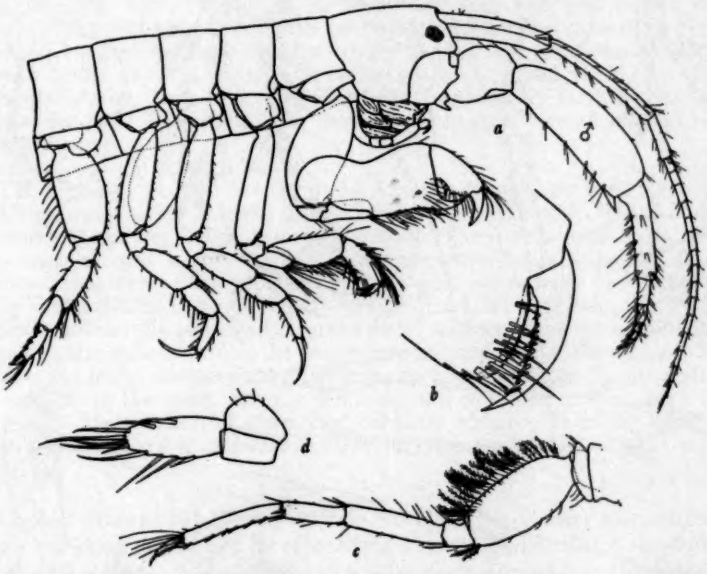

Fig. 1.—*Grandidierella nottoni*, new species, male. *a*, anterior portion of animal. *b*, end of gnathopod 2, greatly enlarged. *c*, peraeopod 5, same scale as *a*. *d*, uropod 3, greatly enlarged.

as long as peduncle and composed of fifteen joints, accessory flagellum minute, about half the length of the first joint of primary flagellum. Antenna 2 robust, but slightly shorter than antenna 1, first and third joints very prominent and strongly developed, fourth joint very strongly developed and nearly twice as long as fifth, flagellum shorter than fifth joint and composed of two long joints and four shorter joints. The fourth and fifth joints of the second antenna of the male bear a distal tooth, thus completing the very close resemblance of this antenna to that of the male *Corophium*. The mouthparts bear a very close resemblance to those figured by Coutière (1904, p. 5, figs. 6–9) for *G. mahafalensis*. Gnathopod 1 is very robust and strong, the fifth joint being produced backward into a very prominent rounding lobe

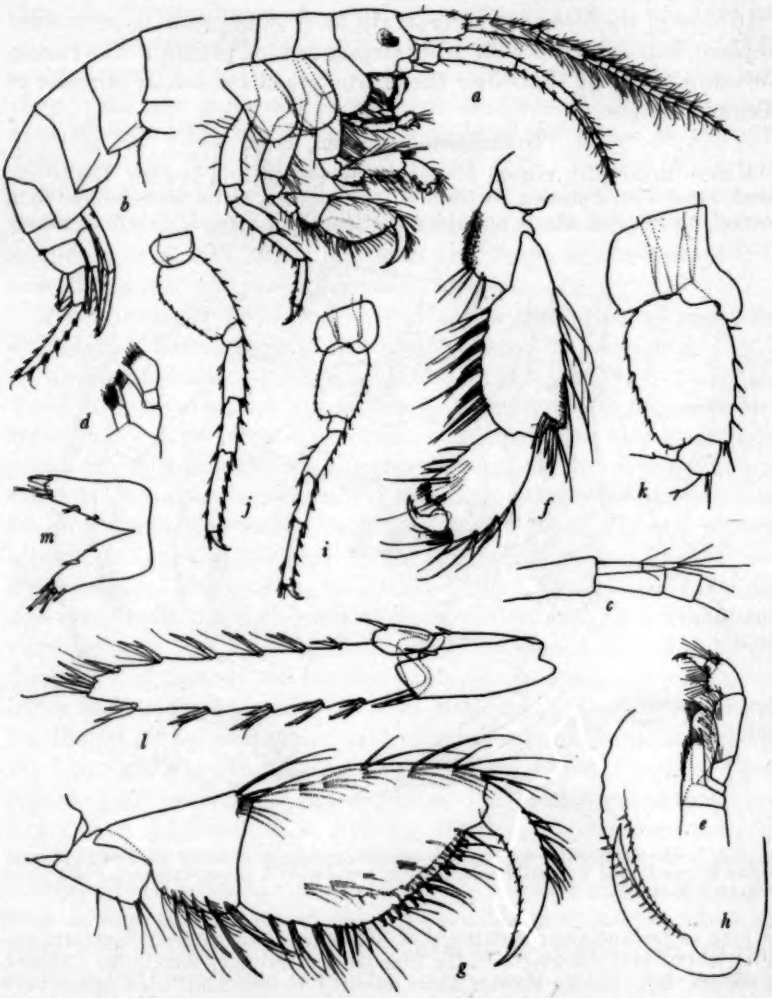

Fig. 2.—*Melita nitida* Smith, male from Mazatlan. *a*, anterior portion of animal. *b*, posterior portion of animal. *c*, accessory flagellum, greatly enlarged. *d*, maxilla 1. *e*, maxilliped. *f*, gnathopod 1. *g*, gnathopod 2. *h*, inside of gnathopod 2 showing shallow groove bounded by spines into which the dactyl fits. *i*, peraeopod 3, same scale as *a* and *b*. *j*, peraeopod 5, same scale as *a* and *b*. *k*, peraeopod 4 of female. *l*, uropod 3. *m*, telson.

much as figured by Chilton (1921, p. 550, figs. 10,n and 10,o) for *G. megnae* but there is not the slightest suggestion of a forward-pointing tooth in the center of the palm either in young or old individuals, nor is the small tooth figured by Chilton (1921, p. 550, fig. 10,e) on the posterior margin of the fifth joint present in any of these specimens from Mazatlan; the prominent tooth on the sixth joint of Chilton's figures (1921, p. 550, figs. 10,n and 10,o) is not present in any of my specimens. Gnathopod 2 bears a close resemblance to Chilton's figure (1921, p. 550, fig. 10,g), except that in the present specimens the second joint is comparatively longer and slenderer and the palm is more nearly transverse. Peraeopods 1 and 2 bear a close resemblance to those of the genera *Microdeutopus* and *Corophium*, but the seventh joint is as long as the sixth, as in *Corophium*. Peraeopods 3 to 5 increasing consecutively in length, peraeopod 5 closely resembling that of *Corophium*, the second joint bearing posterior plumose marginal setae. Side-plates all very shallow, narrower than their respective segments and not in continuity. Pleon segments 1 to 3 with postero-lateral corners broadly rounding. Uropod 1 extending back slightly farther than 2, and the peduncle without a stout spine at distal extremity, as figured by Coutière (1904, fig. 17) for *G. mahafalensis*. Uropod 2 extending back very slightly farther than 3. Telson wider than long, distally truncate, and having a small seta at either lateral corner.

Length.—Male about 7 mm.

The female in general like the male. Antenna 2 not so strongly developed, but the lower lateral margin of the head deeply incised to receive the enlarged first peduncular joint as in the male. The fourth joint of antenna 2 bears on the lower inner margin a distal forward-pointing spine and another similar spine nearer the proximal end. In younger females the distal spine only appears to be present. Gnathopod 1 not much larger than 2 and simply subchelate, the oblique evenly convex distal margin of the sixth joint forming the palm against which the seventh joint exactly fits. Gnathopod 2 like that of the male, though somewhat proportionately shorter. Peraeopods and uropods as in the male. Female about as long as male.

Type.—Male, taken at Mazatlan, Sinaloa, Mexico, February, 1923, by Harry Notton; water brackish, salinity, 13.5 per mill. U.S.N.M. Cat. No. 69742.

Chilton demonstrated that *Grandidierella megnae* (Giles) was subject to great variation in some of its characters, and concluded that *G. mahafalensis* Coutière and *G. bonnieri* Stebbing were synonyms of Giles's earlier species. Later authors have adopted Chilton's view. Recently Dr. Stephensen (1933, pp. 434 and 446) has reported *G. megnae* as being extremely common in shallow salt-water pools, and in cisterns, on the islands of Bonaire and Curaçao off the coast of Venezuela.

As neither young nor old males of the present Mexican specimens show any vestige of a central palmar tooth, nor a tooth on the under side of the sixth joint of gnathopod 1, and as Chilton's figure (1921, p. 550, fig. 10,c) of the second antenna of a mature male does not show the *Corophium*-like development of the present specimens, I have concluded that they represent a new species.

The collection of the U. S. National Museum contains specimens of what I believe to be *G. megnae* (Giles) from two new localities from the West Indian region.

The first lot, consisting of males and females, was taken in February, 1933, by Mr. R. M. Bond from Étang Saumâtre, a brackish lake of Haiti. The largest male, measuring about 5 mm. in length, has in gnathopod 1 only the rudiment of the central palmar tooth, no lower marginal tooth on fifth joint, and no tooth on the under margin of the sixth joint. The largest female with eggs bears on the lower inner margin of the fourth joint of antenna 2 four evenly placed forward-pointing spines. These spines are quite conspicuous, but apparently have not been mentioned in any of the descriptions heretofore.

The second lot consists of three male specimens taken from the stomach of a flounder at Tortugas, Florida during the summer of 1933 by Dr. Harold W. Manter. The largest of the specimens has the first gnathopod nearly as figured by Chilton (1921, p. 550, fig. 10,f). It bears the small central palmar tooth and the small marginal tooth on the lower margin of the fifth joint, but lacks the tooth on the under margin of the sixth joint as does Chilton's. The two smaller specimens bear the central palmar tooth, but not the small tooth on the lower margin. The largest specimen only retains one of the second antennae which appears to be much slenderer than that figured by Chilton (1921, p. 550, fig. 10,a). The first antenna of this male is considerably longer than the second and proportionately much slenderer than that figured by Chilton (1921, p. 550, fig. 10,a). The largest of the specimens measures about 3.5 mm.

As far as we can learn from the published records of the genus *Grandidierella*, it appears to inhabit mainly brackish waters. Tattersall records it from fresh water in China, Stephensen from slightly saline cistern water in Bonaire Island. The specimens from Tortugas, however, were found in the ordinary water of the Gulf of Mexico in the vicinity of the Gulf Stream. The species here described, *G. nottoni*, was taken in brackish water, salinity 13.5 per mill.

MELITA NITIDA Smith

This species was described by Prof. S. I. Smith in 1873 from the coast of New England. Since then it has been reported from widely separated localities along the east coast of the United States as far south as Louisiana, by Paulmier (1905, p. 162), Holmes (1905, p. 505), Pearse (1912, p. 371), Fowler (1912, p. 187), and Kunkel (1918, p. 99).

The present specimens taken in February, 1923, by Mr. Harry Notton are the first to be recorded from the west coast of America. In 1933 Dr. Waldo L. Schmitt, while a member of the Hancock Galapagos Expedition, collected specimens at La Plata Island, Ecuador; Cocos Island, southwest of Costa Rica; and Bahia Honda, Panama.

In west coast specimens the flagellum of antenna 1 is a little shorter than the peduncle and not longer, as Smith (1873, p. 560) records of the New England specimens. The fourth joint of antenna 2 is slightly longer than the second joint of antenna 1 and not scarcely shorter, as stated by Smith. The seventh joint of gnathopod 1 of the male projects inward nearly at a right angle to the sixth joint, as recorded by Smith, but this joint is perfectly developed to fit the palm, so it is probable that the animal has the ability to close it against the palm if necessary. In gnathopod 2 of the male, the dactyl closes against a row of short spines on the inside surface of the sixth joint. As in Smith's specimens, the fifth pleon segment bears posteriorly a row of three or four short spines on either side of the median dorsal line.

In the female the sixth side-plate has the lower front corner produced into a peculiar and characteristic lobe much as that of *Melita palmata* (Montagu).

The largest specimens that I have seen from the west coast of America measure about 6 mm., while Smith gives 7–9 mm. for the New England specimens.

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ENTOMOLOGY.—*A new species of blister beetle from Arizona.*[1]

GUIDO G. MAYDELL.[2] (Communicated by HAROLD MORRISON.)

Epicauta crassitarsis, n. sp.

Reddish pitchy brown, clothed with luteous or cinereoluteous pubescence; on each elytron a whitish longitudinal line. Head black, shining, coarsely but sparsely punctate and clothed with a sparse pubescence; median line distinct; eyes large, feebly emarginate anteriorly, coarsely granulated; antennae dark brown, the first joint enlarged apically, reddish except the apex and provided with rather long cinereous hairs, the second joint with the basal half reddish, the third joint elongated not quite as long as the first two combined, the following decreasing in length and somewhat flattened apically. Prothorax subquadrate, a little longer than wide, parallelsided in three-fourths of the length; median line distinct, punctation and pubescence the same as on the head. Elytra parallelsided, finely punctate-granulate; on each elytron a narrow median line of lighter pubescence not quite reaching the apex; the sutural, apical and lateral margins also whitish. Abdomen and sterna black, the legs reddish, both sparsely clothed with cinereous pubescence. The hind tibial spurs stout, acuminate to the tip. Length 10–11 mm.

Male.—Anterior tibiae with a single short and curved terminal spur. The tarsi of the intermediate legs with the three basal joints bulb-like, enlarged; the first joint the largest and curved in its basal half.

Female.—The anterior tibiae bicalcarate; the tarsi of the intermediate legs normal.

Type.—Male, Tempe, Ariz., Sept. 7, 1933, K. B. McKinney (4–145); 3 paratypes, 1 male, 2 females, labelled in the same way, all in the collection of the U. S. National Museum, Washington, D.C.

[Just before his death a supplementary series of this species, 20 specimens, was received from the same source, but collected by Mr. McKinney on alfalfa Sept. 20, 1934, about a year after the type series above described. Mr. Maydell unfortunately had no opportunity to reconsider his first draft based on only the four above listed types. H. S. B.]

ZOOLOGY.—*New nematodes of the genus* Longistriata *in rodents.*[3]

G. DIKMANS, Bureau of Animal Industry. (Communicated by MAURICE C. HALL.)

Longistriata musculi, n. sp. Figs. 1–7.

Specific diagnosis.—Longistriata: Worms small, with anterior end of body usually coiled in a loose spiral. Cephalic cuticle slightly inflated and marked with annular striations, inflation extending for a distance of 65 to 75μ; beyond this point a cuticular expansion marked by longitudinal striae in-

[1] Received December 3, 1934.

[2] During the few days before his sudden death on September 28, 1934, Mr. Maydell had been adding to his manuscript revision of the Meloid genus *Epicauta* from the data assembled in the U. S. National Museum. The abrupt termination of his labor leaves this revision uncompleted. Among his last written additions the following description of a peculiar southwestern species about which he had spoken with much interest is complete and ready for publication. H. S. Barber.

[3] Received December 11, 1934.

creasing in number from anterior to posterior end. Immediately posterior to cervical inflation longitudinal striae numbering about 6 to 8; in posterior portion striae numbering about 18 to 20, all striae being marked by fine cross striations. Head rounded; mouth and circumoral papillae inconspicuous. Esophagus 320 to 450μ long by 30 to 40μ wide in its terminal portion. Nerve ring near middle of esophagus. Excretory pore near beginning of posterior fourth of esophagus.

Male 3.25 to 4.5 mm. long by 95 to 100μ in maximum diameter immediately anterior to bursa. Bursa relatively large and symmetrical. Ventro-ventral ray shortest and slenderest, and externo-dorsal longest and thickest, of paired rays; remaining paired rays about equal in size; tips of rays approximately equidistant at margin of bursa except for postero-lateral and externodorsal, these rays approximated to each other. Dorsal ray divided into 2 branches in its distal third, each branch again dividing near tip, external branch of second bifurcation longer than inner branch. Spicules 390 to 420μ long, straight and filiform, with triangular enlargement at distal ends. Gubernaculum absent.

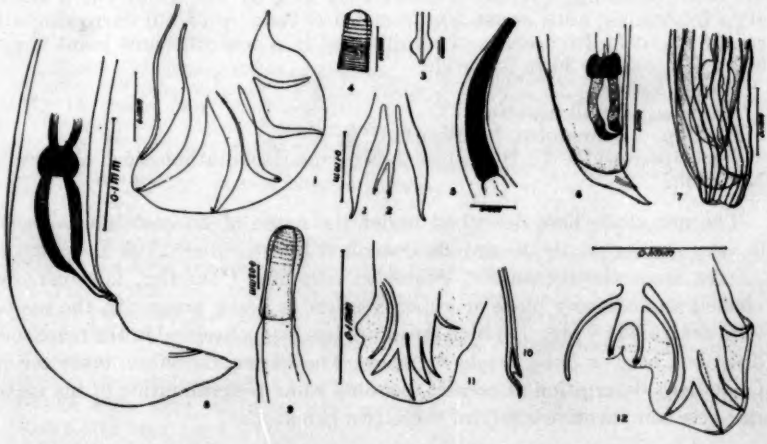
Female 4.25 to 6.75 mm. long and about 100 to 160μ wide in region of proximal portion of ovejector. Ovejector single, stout, muscular, about 100μ long. Vulva to anus, 90μ; anus to tip of tail, 30μ. Eggs 55 to 60μ long by 30 to 32μ wide.

Host.—*Mus musculus.*

Location.—Small intestine.

Locality.—Jeanerette, Louisiana, U. S. A.

Type specimens.—U. S. National Museum Helminthological Collection No. 30456.



Figs. 1–7.—*Longistriata musculi.* Fig. 1. Lateral view of bursa. Fig. 2. Dorsal rays of bursa. Fig. 3. Terminal portion of spicules. Fig. 4. Anterior portion of head. Fig. 5. Anterior portion of body. Fig. 6. Posterior portion of body of female, showing ovejector. Fig. 7. Posterior portion of body of female, showing longitudinal striations of cuticle.

Figs. 8–12.—*Longistriata norvegica.* Fig. 8. Posterior portion of body of female, showing ovejector. Fig. 9. Anterior portion of body, showing cuticular inflation. Fig. 10. Terminal portion of spicule. Figs. 11 and 12. Bursa.

Longistriata norvegica, n. sp. Figs. 8–12.

Specific diagnosis.—Longistriata: Worms small, usually coiled in a loose spiral. Cervical inflation characteristic of this group of nematodes, about 75 to 80μ long by 25 to 30μ wide, the anterior widest portion marked by annular striations. Width of head, exclusive of inflation, about 16μ. Cuticle of body inflated and marked by longitudinal striae, each striation showing cross striations. Esophagus 275 to 300μ long and 20 to 25μ wide in its distal portion. Nerve ring about 150 to 175μ, and excretory pore about 20 to 27μ, anterior to termination of esophagus.

Male about 4 to 4.5 mm. long by 45 to 50μ wide just anterior to bursa. Cuticular inflation extending on ventral side of body to within 30 to 35μ anterior to commencement of bursa. Bursa symmetrical, with 2 lateral lobes and 1 dorsal lobe. Spicules 350 to 375μ long, filiform, distal ends divided into 2 branches enclosed in a sheath. Gubernaculum absent. Ventro-ventral ray shortest and slenderest of the paired rays, directed forward and widely separated from latero-ventral ray. Latero-ventral, externo-lateral and medio-lateral rays of about equal thickness and length, the first 2 being parallel and diverging only slightly in their distal portions; externo-lateral the thickest ray; medio-lateral ray the longest ray and directed straight towards margin of bursa. Postero-lateral ray originating from a common stem with medio-lateral and directed dorsally; these two rays widely separated at their tips. Externo-dorsal rays and dorsal ray originating from a common stem, the former being very slender and curving outward from dorsal; stem of dorsal very wide and bifurcating at middle; each branch divided at tip, outer branch longer than inner. None of rays reaching margin of bursa.

Females 5 to 5.5 mm. long and about 90μ wide in region of vulva. Single ovejector, including sphincter, about 100μ long by 40μ wide. Vulva about 100μ from anus; anus about 30μ from tip of tail; tip of tail narrowing abruptly about 5μ from end and terminating in a conical, blunt point. Eggs 60 to 65μ long by 30 to 35μ wide.

Host.—Rattus sp.

Location.—Small intestine.

Locality.— Jeanerette, Louisiana, U. S. A.

Type specimens.—U. S. National Museum Helminthological Collection No. 30457

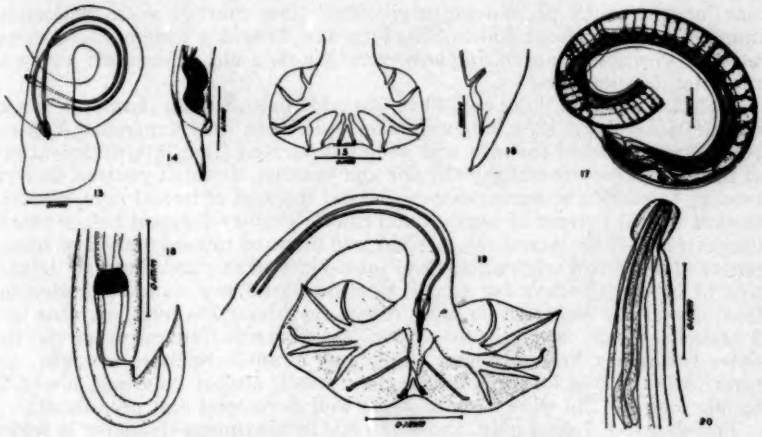
The nematode here described under the name of *Longistriata norvegica* is very similar to the nematode described by Chandler (2) as *Longistriata adunca* from the cotton rat, *Sigmidon hispidus*. Chandler, however, described an accessory piece or gubernaculum as being present in the nematode described by him. No such structure has been observed in the nematode described here as *Longistriata norvegica*. The writer, therefore, must accept Chandler's description as correct, pending some reexamination of his material or a comparative study of these two nematodes.

Longstriata carolinensis, n. sp. Figs. 13–17.

Specific diagnosis.—Longistriata: Worms small, usually rolled in a loose spiral. Cervical inflation about 50μ long by 30μ wide. Cuticle of body inflated and marked with distinct longitudinal striations or bands, these in turn distinctly marked with cross-striations. Head rounded, mouth opening and circumoral papillae inconspicuous. Esophagus 280 to 310μ long by 35 to

40μ wide in its terminal portion. Excretory pore about 120μ anterior to termination of esophagus. Nerve ring slightly anterior to excretory pore.

Male 2.7 to 3 mm. long and 70 to 80μ in maximum diameter immediately anterior to bursa. Bursa symmetrical, 125 to 130μ long and 225 to 250μ wide when fully expanded. Ventro-ventral rays short and slender, directed forward; latero-ventral ray widely separated from and somewhat larger than ventro-ventral ray and also directed forward; externo-lateral, thickest of the paired rays, widely separated from latero-ventral, but parallel to medio-



Figs. 13–17.—*Longistriata carolinensis.* Fig. 13. Posterior portion of male, showing spicules and gubernaculum. Fig. 14. Posterior portion of female, showing ovejector. Fig. 15. Bursa. Fig. 16. Posterior portion of female, showing relative positions of vulva and anus. Fig. 17. Posterior portion of female.

Figs. 18–20.—*Longistriata dalrymplei.* Fig. 18. Posterior portion of female, showing ovejector. Fig. 19. Posterior portion of male, showing bursa and spicules. Fig. 20. Anterior portion showing cuticular inflation.

lateral except at tip, here the latter two rays diverging slightly, externo-lateral bending ventrad and medio-lateral running straight toward margin of bursa; postero-lateral ray originating from medio-lateral ray and directed posteriorly to margin of bursa, the tips of these rays widely separated, all these rays reaching margin of bursa. Externo-dorsal rays originating separately from dorsal ray; dorsal ray divided into rather long branches, each of these bifurcated at tip; branches of bifurcation equal in size. Spicules 400 to 450μ long, filiform, with expanded proximal ends. Gubernaculum about 25μ long by 15μ wide.

Female about 3.5 mm. long. Ovejector single, about 80μ long. Vulva 60 to 65μ from anus; tip of tail 40 to 50μ from anus. Tail narrowing abruptly shortly before its termination and ending in a blunt point. Eggs 58μ long by 30 to 35μ wide.

Hosts.—*Peromyscus maniculatus* (Deer mouse), and *Microtus ochrogaster* (Prairie meadow mouse).

Location.—Small intestine.

Localities.—Great Smoky Mountains, North Carolina, and Vincennes, Indiana, U. S. A.

Type specimen.—U. S. National Museum Helminthological Collection No. 30458.

Longistriata dalrymplei, n. sp. Figs. 18-20.

Specific diagnosis.—*Longistriata:* Worms small, delicate, usually rolled in a loose spiral. Cervical inflation 45 to 60μ long by 27 to 43μ wide. Cuticular inflation with prominent longitudinal lines marked with cross-striations. Esophagus about 250 to 300μ long and 20 to 25μ wide in its terminal portion. Position of nerve ring and excretory pore not determined owing to condition of specimens.

Male 3.7 to 4 mm. long and 40 to 50μ wide in maximum diameter. Bursa symmetrical, about 125μ long and 300μ wide when fully expanded. Ventro-ventral ray directed forward and widely separated from latero-ventral ray at the tip; latero-ventral ray slender and pointed, directed ventrad and extending to margin of bursa; externo-lateral thickest of bursal rays, directed toward lateral margin of bursa, but bending slightly forward before reaching margin. Medio-lateral ray straight and directed toward margin of bursa; postero-lateral ray originating from medio-lateral ray and directed dorsad, tips of two latter rays far apart. Externo-dorsal ray slender, originating from dorsal ray 30μ from its base; dorsal ray about 75μ long, dividing into 2 branches about 20μ from distal end, each branch bifurcating at the tip; outer secondary branch longer than inner branch. Spicules straight, filiform, 340 to 360μ long. Gubernaculum small, almost colorless, about 25 to 30μ long by 15μ wide. Genital cone well developed and prominent.

Female 4 to 4.7 mm. long, and 70 to 80μ in maximum diameter in region of ovejector. Ovejector single, well developed, about 100μ long. Vulva to anus, 50 to 60μ; anus to tip of tail, 40 to 60μ. Tail ending in a sharp point. Eggs 55 to 65μ long and 35 to 40μ wide.

This nematode closely resembles *Longistriata vexillata* (Syn. *Heligmosomum vexillatum* Hall, 1916). It differs from the latter in the possession of a gubernaculum, in the absence of spurs on the dorsal ray between the origin of the externo-dorsal rays and the bifurcation, and in the absence of maculae on the bursal membrane.

Hosts.—*Ondatra zibethica* (Muskrat) and *Microtus pennsylvanicus* (Meadow mouse).

Location.—Small intestine.

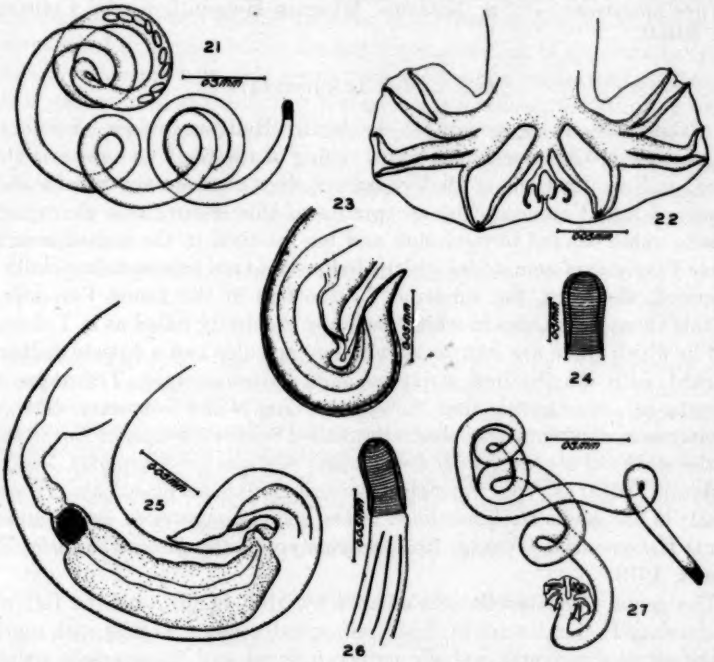
Localities.—New Jersey, Indiana, and Minnesota, U. S. A.

Type specimens.—U. S. National Museum Helminthological Collection No. 30459.

Longistriata noviberiae, n. sp. Figs. 21-27.

Specific diagnosis.—*Longistriata:* Worms small, delicate, spirally coiled, bright red in color when freshly collected. Cephalic cuticle slightly inflated, showing distinct transverse striations; inflation 45 to 60μ long by 25 to 30μ wide. Cuticle of body inflated, showing longitudinal striae marked with cross-striations. Esophagus 270 to 300μ long by 25 to 32μ wide near its termination. Nerve ring 165 to 175μ from anterior end. Excretory pore situated from 15μ anterior to 25μ posterior to termination of esophagus.

Male 4 to 5 mm. long by 55 to 65μ in maximum diameter. Bursa symmetrical, about 130 to 150μ long and 240 to 260μ wide when expanded. Ventral rays of approximately the same size, divergent at tips and directed forward, reaching margin of bursa; latero-ventral ray terminating in a slight projection on bursal margin; externo-lateral and medio-lateral rays close together and parallel for greater part of their length, diverging near



Figs. 21–27.—*Longistriata noviberiae.* Fig. 21. Female. Fig. 22. Bursa. Fig. 23. Terminal portion of female. Figs. 24 and 26. Anterior portion of body, showing cervical inflation. Fig. 25. Posterior portion of female, showing ovejector. Fig. 27. Male.

their termination; externo-lateral ray bending sharply ventrad, and medio-lateral ray continuing straight to bursal margin; postero-lateral ray originating from medio-lateral ray, diverging sharply from latter, and directed dorsad, reaching posterior margin of bursa, tips of these two rays widely separated; externo-dorsals originating from a common stem with the dorsal ray and approaching posterior margin of bursa in close proximity to termination of postero-lateral rays; dorsal ray bifurcated, forming 2 fairly widely divergent branches, the latter also bifurcating to form 2 terminal branches. Bursal margin slightly indented in region of dorsal ray. Spicules slender, filiform and equal, 420 to 430μ long. Gubernaculum present, about 35μ long by 15μ wide.

Female 5.5 to 6.5 mm. long by 75 to 80μ wide in region of vulva. Tail pointed and bent sharply ventrad in all specimens examined. Vulva with 2

prominent lips, about 100 to 120μ from tip of tail; anus 45 to 55μ from tip of tail. Ovejector single, about 165μ long. Eggs 70 to 75μ long by 35 to 40μ wide.

Host.—Rabbits (probably *Sylvilagus floridanus alacer* and *Sylvilagus palustris littoralis*).

Location.—Small intestine.

Locality.—Jeanerette, Louisiana, U. S. A.

Type specimens.—U. S. National Museum Helminthological Collection No. 30460.

THE GENUS LONGISTRIATA

In their key to the genera of the family Heligmosomidae, Yorke and Maplestone (1926), regard the spiral rolling of the body as a generic character, and on the basis of that character they separate the genera *Heligmosomum* and *Viannaia*. The acceptance of this feature as a character of generic value has led to confusion and has resulted in the inclusion in the genus *Viannaia* of nematodes which obviously do not belong to it. Schulz (4) proposed, therefore, the subgenus *Longistriata* in the genus *Viannaia* to include those nematodes in which the body is spirally rolled as in *Viannaia*, and in which there are comparatively long spicules and a cuticle distinctly marked with longitudinal striations as in *Heligmosomum*. Travassos and Darriba (6), after noting that the spiral rolling of the body cannot be considered as a distinguishing character, raised Schulz's subgenus *Longistriata* to the status of a genus, with *Longistriata depressa* (=*Strongylus depressus* Dujardin, 1845) as type, transferred several nematodes placed by Travassos (1921) in the genus *Heligmosomum* to the genus *Longistriata*, and made the genus *Heligmonella* Monnig, 1927, a synonym of the genus *Viannella* Travassos, 1918.

The genus *Heligmonella* was created by Monnig (3) with the following diagnosis: "Heligmosominae: body red, spirally coiled, cuticle with marked longitudinal striations; cephalic cuticle inflated and transversely striated. Male: bursa with ventral rays separate and diverging, postero-lateral diverging from externo- and medio-lateral, externo-dorsal arises from a common dorsal trunk, dorsal bifurcated near its extremity, the branches also bifurcated; spicules slender, gubernaculum distinct. Female: vulva near anus, a single uterus. Parasites in stomach and intestine of rodents."

The genus *Heligmonella* differs, therefore, markedly from the genus *Viannaia* in the character of the spicules and in the course and direction of the bursal rays, and its proposed inclusion in the genus *Viannaia* appears to be unwarranted. The genera *Longistriata* and *Heligmonella* resemble each other in the possession of (1) transversely striated cephalic inflation, (2) an expanded and longitudinally striated cuticle, (3) comparatively long and slender spicules, and (4) comparably directed bursal rays, and on the basis of these resemblances the genus *Heligmonella* is here made a synonym of the genus *Longistriata*.

Baylis (1) described a number of new species in the genus *Heligmonella*. These species also are here transferred to the genus *Longistriata*.

It is recognized that the nematodes described in this paper as *Longistriata musculi*, *L. norvegica* and *L. carolinensis*, while resembling other members of the genus *Longistriata* in the possession of an inflated and transversely striated cephalic cuticle, an expanded and longitudinally striated body cuticle, and long and slender spicules, differ from each other and from other members of this genus in the character and direction of the bursal rays, and that their inclusion in this genus may seem to be unwarranted. However, since only a limited amount of material was available for study it was not considered desirable to create new genera for them at the present time.

Heligmostrongylus hassalli Price, 1928, also is here placed in the genus *Longistriata* because in all other species of the genus *Heligmostrongylus* the dorsal ray is completely doubled and in *Heligmostrongylus hassalli* this feature is absent.

The generic diagnosis is amended as follows:

LONGISTRIATA

Generic diagnosis.—Heligmosomidae: Body more or less strongly rolled in a spiral. Cephalic cuticle inflated, marked with annular striations. Cuticle of body expanded and distinctly marked with transversely striated longitudinal lines, continuous or interrupted at intervals. Bursa symmetrical or asymmetrical, with well developed single bifurcated dorsal ray. Spicules comparatively long and slender. Gubernaculum present or absent. Female with well developed single ovejector close to posterior end of body. Vagina short. Vulva close to anus.

Type species.—*Longistriata depressa* (Duj., 1845).

KEY TO SPECIES OF LONGISTRIATA

1. Gubernaculum present and well developed.....2
   Gubernaculum absent or rudimentary.....16
2. Longitudinal striae interrupted at regular intervals.....*L. hassalli*
   Longitudinal striae continuous.....3
3. Gubernaculum asymmetrical.....*L. seurati*
   Gubernaculum symmetrical.....4
4. Spicules 1 mm. long.....*L. monnigi*
   Spicules varying in length from 230 to 450μ.....5
5. Dorsal margin of bursa deeply indented.....*L. cristata*
   Dorsal margin of bursa only slightly indented or without indentation..6
6. Externo-dorsal rays originating separately from dorsal ray.....
   .....*L. carolinensis*
   Externo-dorsal rays originating from a common stem with the dorsal ray.....7
7. Bursa asymmetrical.....8
   Bursa symmetrical.....9

8. Bursa large, 500 to 600μ wide; branches of dorsal ray close together and each provided with 2 terminations..... *L. streptocerca*
Bursa about 250μ wide; branches of dorsal ray fairly wide apart and each provided with 3 terminations..... *L. trifurcata*
9. Branches of dorsal ray as long as or longer than main stem. *L. intermedia*
Branches of dorsal ray shorter than main stem.....10
10. Externo-dorsal rays very slender..... *L. dalyrmplei*
Externo-dorsal rays comparatively stout.....11
11. Terminal branches of dorsal ray equal..... *L. wolgaense*
Terminal branches of dorsal ray unequal.....12
12. Males 2.6 to 3.25 mm. long; females 3.4 to 3.9 mm. long.....13
Males 3.8 to 5.5 mm. long; females 5.5 to 9.2 mm. long.....14
13. Spicules 400μ long by 4 to 5μ wide; vulva 120μ from tail end. *L. affinis*
Spicules 230 to 280μ long by 2.5μ wide; vulva 150μ from tail end..... *L. gracilis*
14. Spicules 270 to 360μ long; vulva 150μ from tail end..... *L. impudica*
Spicules 410 to 430μ long; vulva either 120μ or 165μ from tail end....15
15. Spicules 410μ long; vulva 165μ from tail end; ovejector 310μ long..... *L. spira*
Spicules 420 to 430μ long; vulva 120μ from tail end; ovejector 165μ long..... *L. noviberiae*
16. Dorsal ray with accessory branch..... *L. vexillata*
Dorsal ray without accessory branch.....17
17. Stem of dorsal ray 20μ wide..... *L. norvegica*
Stem of dorsal ray 5 to 15μ wide.....18
18. Externo-dorsal rays largest of bursal rays; distal ends of spicules enlarged..... *L. musculi*
Externo-dorsal rays larger than some and smaller than other bursal rays; distal ends of spicule not enlarged.....19
19. Spicules 600 to 800μ long.....20
Spicules 340 to 560μ long.....22
20. Dorsal ray doubled for more than half its length..... *L. nematodiriforme*
Dorsal ray divided into 2 branches, each less than half the length of dorsal ray.....21
21. Externo-dorsal ray very slender; inner branch of terminal bifurcation of dorsal ray with slight projection..... *L. didelphe*
Externo-dorsal ray stout; inner branch of terminal bifurcation of dorsal ray without projection..... *L. alpha*
22. Terminal branches of dorsal ray not divided..... *L. gamma*
Terminal branches of dorsal ray divided.....23
23. Terminal branches of dorsal ray equal..... *L. delta*
Terminal branches of dorsal ray unequal, outer branch longer. *L. beta*

Longistriata adunca Chandler, 1932, is similar to *L. norvegica*, differing only in the presence of a gubernaculum described for *L. adunca*.

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BOTANY.—*Certain Desmonci (Palmae) of Central America and Mexico,*[1] H. H. BARTLETT, University of Michigan.[2]

The genus *Desmoncus* provides one of the characteristic features of tropical American vegetation. It is often remarked that in the western hemisphere the *Desmonci* take the place of the far more viciously armed climbing palms of the Oriental tropics, such as *Calamus* and *Daemonorops,* which are systematically not closely related, but in their climbing habit, armature, and ecological relations offer some points of resemblance.

To secure specimens of the climbing palms takes much of a collector's time and effort, since they are often not found in fertile condition or easily secured even if found, because of their spininess and difficulty of disengaging them from the limbs of the trees through which they clamber. Good specimens are therefore disproportionately rare in our herbaria, in consideration of their importance in the composition of the tropical forest. Many of the described species are inadequately known, and it has become customary to use a few names as catch-alls for very distinct plants.

It appears that the species of *Desmoncus* are in reality rather local in distribution, and that much careful work on the part of collectors and herbarium botanists will be required to ascertain their ranges and characteristics.

In British Honduras and Guatemala the writer came in contact with a group of *Desmonci* related to *D. chinantlensis* Liebm., which

[1] Received November 20, 1934.
[2] Papers from the Department of Botany and the Herbarium of the University of Michigan, no. 508.

was described from Mexico and remains very inadequately known. These related plants of northern Central America are called "basket tie-tie" or "basket whist" by the inhabitants of British Honduras and "bayal" by the Spanish-speaking people and the Maya. In British Honduras any vine is a "tie-tie," and the *Desmonci* are the particular "tie-ties" of which baskets are made—whence the name.

Either there are many local species with rather slight distinctions, as the writer believes, or else there is a very wide-spread species, *Desmoncus chinantlensis* Liebm., made up of a group of varieties, or (as some botanists might even conclude) of taxonomically negligible variations. Several of these minor species are here described. There are indications in the herbaria that other species of the same order of distinctness remain to be described, but unfortunately entirely satisfactory material is lacking.

In addition to the species related to *D. chinantlensis* there are others farther south in Central America which have quite different relationships. It is evident that the alliance of *D. chinantlensis* does not hold the field alone much south of Guatemala, although Bailey[3] found a species in Panama which he has tentatively referred to it.

There is some question as to the interpretation of Liebmann's *D. chinantlensis* which might best be cleared up by renewed collecting and study at the type locality. Bailey refers to a sheet at Copenhagen as the type specimen (Liebmann no. 6595), and remarks that it does not agree with two specimens in the United States National Herbarium (Liebmann nos. 6594 and 6596). Since the original description (Martius, Historia Palmarum 3: 321. 1850) cites no specimen whatever, it seems best to typify the species by a specimen or specimens conforming as closely as possible with the original description, and from this standpoint the specimens in the United States National Herbarium may be fairly viewed as cotypes. I have considered them as such in my interpretation of the species. The justification for so doing lies in the fact that the *Desmoncus* from Barro Colorado Island, Panama, which Bailey figures and which agrees with the particular Liebmann specimen (no. 6595) that he regards as the type of *D. chinantlensis*, does not conform to the original description. It appears to lack the beard of spines on the upper side of the base of the leaflet, which is characteristic of the entire alliance of *D. chinantlensis*, and which Liebmann refers to in the description ("*pinnis . . . antice juxta nervum aculeatis*"). Bailey's Barro Colorado plant also agrees with Liebmann's no. 6595 in having "thin, not stiffly veined glabrous pin-

[3] BAILEY, L. H. *Certain palms of Panama.* Gentes Herbarum 3: 31–116. 1933.

nae 8 inches or less long." On the contrary, the two Liebmann specimens in the National Herbarium have, as Bailey says, "different looking, very costate pinnae and much smaller spines." Referring again to Liebmann's original description, we find that the lower leaflets should be 9 inches long, not 8 *or less*, and that the pinnae should be strongly plicate (*"pinnis . . . valde plicatis"*) rather than "thin, not stiffly veined." Furthermore, Liebmann describes a type with dimorphic spines on the petioles and lower rhachis, and with the leaflets irregularly aggregated, whereas Bailey's species, which agrees with Liebmann 6595, has (according to the figure) spines of a single type and pinnae "mostly opposite or subopposite." In view of the discrepancies between Bailey's plant and the Liebmann description of *D. chinantlensis*, I have preferred to interpret the latter as being really represented by Liebmann's nos. 6594 and 6596 in the United States National Herbarium.

The entire alliance of *Desmoncus chinantlensis* lacks hooked prickles, has a beard of *aciculae* on the upper surface of the leaflet near the base, and is presumably characterized by nine rather than six stamens, although not all of the species are known from flowering specimens. Leaving out a couple of species which are doubtless distinct, but of which the material is inadequate for description, the group may be arranged as follows:

Corolla of female flower containing at one side of the ovary a fimbriate, oblong, basally attached scale as long as the corolla lobes; leaflets only about 1 cm. broad.....*D. anomalus*

Corolla of female flower containing no such scale; leaflets over 2.5 cm. broad.

Axis and branches of inflorescence thick and somewhat fleshy.....
.....*D. chinantlensis*

Axis and branches of inflorescence thin, not fleshy.

Rhachis even if short-aciculate also armed below the middle with a few distant retrorse or subretrorse spines which are the longest ones on the plant.

Inferior spathe aciculate: female flowers with annuliform-cupulate calyx, very obtusely 3-apiculate and corolla broader than high, nearly evenly truncate, but sharply though minutely 3-apiculate.....*D. Lundellii*

Inferior spathe entirely or nearly unarmed: female flowers with acutely triangular-cupulate calyx and corolla higher than broad with margin 3-apiculate from deep rounded sinuses.....
.....*D. quasillarius*

Rhachis sparsely to densely aciculate with spines no longer than those on other parts of the plant, and not clearly dimorphic.

Inferior spathe almost unarmed.....*D. uaxactunensis*
Inferior spathe aciculate: corolla of female flower broader than high, obtusely 3-apiculate with shallow obtuse sinuses.....*D. ferox*

Desmoncus anomalus sp. nov.

Scandens pergracilis. Vaginae pars superior (ochrea) 12 mm. diam., 22 cm. longa albida, cinnamomeo-furfuracea, subappresse aciculata, aciculis majoribus 8 mm. longis, juventate ferrugineo-pubescentibus. Petiolus 1.5 cm. longus, debiliter et breviter aciculosus. Rhachis petiolo similis 165 cm. longa subtus subinermis, furfuracea, supra sparsim [illegible]nata, aciculis majoribus 12 mm. longis. Foliola utrinque ca. 19, basi debiliter aciculata inferiora ca. 22 cm. longa, 7 mm. lata in filum attenuata; mediocria ca. 21 cm. longa, 10–12 mm. lata; superiora 24 cm. longa, 8 mm. lata, caudato-acuminata. Foliolorum paria intermedia in uncos transeuntia reflexa, ca. 14 cm. longa, 2 mm. lata. Uncorum paria 10 debilia, inferiora ca. 12 cm. inter se distantia, 6 cm. longa, superiora 1.5 cm. distantia, 2.5 cm. longa. Cirrhus omnino inermis. Spatha inferior 28 cm. longa, 14 mm. lata, sparsissime breviterque appresso-aciculata. Rami fertilis pars inter spathas 29 cm. longa, 10 mm. lata, compressa, sparsim appresso-aciculata. Spatha superior deest. Pedunculus 6 cm. longus, aciculas 4–10 mm. longas ferens. Rhachis ramifer 20 cm. longa, albida, sparse ferrugineo-furfuracea; ramis floriferis ca. 35 valde flexuosis, inferioribus 12 cm. longis. Flores inferiores terni, bracteolis 1 vel 3 firmis brevissimis anguste lunulatis vel canaliculiformibus apiculatis subtenti. Flores feminei centrales; gamopetali et gamosephali. Calyx subannuliformis vel circumscriptione rotundato-triangulus, angulis obtusissimis rotundatis. Corolla (solum vetusta fructibus delapsis visa) obtusissime apiculata, unilateraliter includens squamam lobis corollae 2.2 mm. longis propriis aequilongam et 2 mm. latam apice fimbriatam. Staminodia vestigialia basi corollae connata. Pistillum et fructus desunt. Flores masculi omnes delapsi sed eorum cicatrices in ternis inferioribus laterales et in ramorum apicibus singuli.

Specimen typicum in U. S. Nat. Herb. in Guatemala legerunt *O. F. Cook* et *C. B. Doyle*, no. 97, ad Secanquim, in Alta Vera Paz.

Desmoncus Lundellii sp. nov.

Scandens caule sursum vaginis tecto 2.5 cm. diam. nudato ca. 1.7 cm. Folia caulem imbricate vaginantia. Vaginae supra petioli insertionem in ochream apice in fibros dissolutam 18 cm. longam productae, pallide griseo-cinnamomeae, aciculis ex papillis anguste conicis vel subcylindricis orientibus, subascendentibus atris juventate sordide furfuraceo-pubescentibus, longioribus 16 mm. longis dense armatae. Petioli pars libera 2 cm. longa 12 mm. lata et rhachis pars basalis subtus sparsim supra densius aciculatis cum duarum aciculis specierum aut pergracilibus ca. 6 mm. longis aut validis 3.5–5 cm. longis. Rhachis ca. 1.75 m. longa foliolis utrinsecus ca. 20, lanceolatis, acutis, gregatim alternis, infimis ca. 17 cm. longis 2.5 cm. latis; mediis ca. 32 longis 3.4 cm. latis; supremis 26 cm. longis, 3.0 cm. latis; transitionalibus retroflexis 1-jugis 14 cm. longis 4.5 mm. latis; amnibus longitudinaliter subplicatis ca. 20-venosis utrinque obscure transverse venulosis, supra prope basin horride aciculatis, aciculis ca. 20–30, longioribus 3.0–4.0 cm. longis, subascendentibus, etiamque in venae mediae tertia parte basali aciculas 2–4 ferentibus. Cirrhus sparsim longiaciculatus uncos jugatim ferens, basi valde incrassatos, lateraliter compressos, rigidos,

majores 3.5 cm. longos, secus rhachin 11 cm. separatos; intermedios 2.5 cm. longos, 7 cm. separatos; ultimos non visos. Spatha inferior fere glabra apice sparse et appresse breviaciculata. Spatha superior fusiformis 22–30 cm. longa, 3–4 cm. diametiens, dense armata, aciculis atris rectis diverse directis majoribus ca. 12 mm. longis. Pedunculus 4–10 cm. longus aciculis subascendentibus vestitus. Inforescentiae pars ramosa 18–20 cm. longa, solum ad basin aciculata ramis simplicibus ca. 30, longioribus 10 cm. longis, hand carnosis valde acutangulatim contortis vel flexuosis. Flores superiores solitarii staminei sessiles bracteolis rigidiusculis subretroflexis .5–1.0 mm. longis subtenti, ex calyce membranaceo gamosepalo, corolla longe pyramidato tripetala et staminibus (9?) constituti, calyce excentrico, horizontaliter 3.3 mm. lato (si applanato), longitudinaliter 2.3 mm. diametiente; petalis carnosis, deltoideis 9 mm. longis, longe acutis. Flores inferiores terni unus femineus medius alii 2 staminei (delapsi) lateraliter et superiuscule positi et bracteolis minutis triangulis subtenti. Floris feminei calyx symmetricus membranaceis 3 mm. diam. annuliformis apices subobsoletos sepalorum unitorum obtusissimos obscure exhibitantes. Corolla carnosa sympetala cyathiformis 2.8 mm. diam. 2.5 mm. alta, margine minutissime triapiculata. Stamina vel staminodia nulla. Ovarium unilocularium ellipsoideum apice acuto breviter 3-stigmatosum. Fructus ovoideus 13 mm. longus, 11 mm. diametiens, pericarpio tenui carnoso, endocarpio osseo paululum supra aequatorem foraminibus 3, placentis parietalibus oppositis, perforatis.

Specimen typicum in Herb. Mich. legit *C. L. Lundell* prope El Paso de Petén, Petén, Guatemala, 26 Apr. 1932.

Desmoncus quasillarius sp. nov.

Scandens, caule vaginato ca. 3 cm. crasso. Vaginae pars supra petioli insertionem (ochrea) ca. 15 cm. longa, apice in fibros dissoluta, griseo-cinnamomea, aciculis atratis plerumque quam 1 cm. brevioribus modice tecta. Petiolus 22 mm. longus minus aciculatus quam ochrea. Rhachis ca. 1.9–2.0 m. longa, tenuiter ferrugineo-furfuracea, supra aciculas specierum duarum ferens, paucas compressas fere 14 mm. longas et alias breviores, omnes patentes vel subascendentes; subtus solum infra medium spinas longiores pauciores retroflexas 2 cm. longas validas ferens, sursum in cirrhum omnino inermem transeuns. Foliola subplicata, glabra, utrinsecus ca. 22, inferiora irregulariter aggregata, superiora pariter subalterna vel subopposita; infima 23 cm. longa, 14 mm. lata, supra ad basin barbatim aciculata, aciculis ca. 6–10 longioribus 15 mm. longis, apice longe attenuata, et subtus, caudam apicalem versus, acicula solitaria 13 mm. longa instructa; media ca. 30 cm. longa, 3 cm. lata acuminata ad basin minus barbata, solum 4–6 aciculas, longiores ca. 20 mm. longas, ferentia; suprema 24 cm. longa, 32 mm. lata, basi et apice longe angustata, leviter barbata, aciculas solum 1–3 breves ferentia. Foliola 2 transeuntia in uncos recurvata base incrassata non barbata 18.5 cm. longa 18 mm. lata. Uncorum paria 9 infima 7 cm. longa, inter se 10 cm. distantia, sequentia gradatim breviora et propinquantia. Spatha inferior inermis vel sparsissime et breviter aciculata, ca. 14–18 mm. lata; pars aperta ca. 7 cm. longa. Ramus fertilis infra spatham superiorem sparse et breviter aciculatus. Spatha superior fusiformis ca. 27 cm. longa, 22 mm. crassa, deorsum angusta ferrugineo-furfuracea, breviter (2–4 mm.) aciculata, sursum horride aciculata, aciculis diverse directis plerumque porrectis. Pedunculus 5 cm. longus, patenter et breviter aciculatus, aciculis longioribus ca. 4 mm. longis, haud retrosis. Inflor-

escentiae axis simpliciter ramifer inermis, tenuiter ferruginosus, ramis valde angulatim flexuosis ca. 35, deorsum flores ternatim sursum singulatim ferentibus, gracilibus, haud carnosis. Flos centralis femineus, laterales staminei, omnes bracteola subcartilaginea communi probabiliter composita, anguste lunata, obscure 3-apiculata vel integra, subtenti. Flores feminei conici vel subcylindrici, gamosepali, gamopetali; calyce cupuliformi 2.5 mm. diam. (si non applanato) 1 mm. alto, margine minute et distanter triapiculato; corolla 3.5 mm. alta, 2.3 mm. lata, apice profunde (tertia parte) tricuspidata, apicibus triangulo-subulatis, sinubus rotundatis; staminodiis vestigialibus minutissimis; ovario corollam excedente, anguste ablongo, breviter tristigmatoso. Flores masculi in parte rami floriferi terminali singuli, bracteolis singulis vel binis brevibus acutis divergentibus subtenti. Flores staminei 10–12 mm. longi, calyce membranaceo gamosepalo cupuliformi acute triapiculato, si applanato asymmetrice triangulo, angulis acutis. Petala 3 distincta cartilaginea basi subovata apice sublutao longe producta. Stamina 9. Pistillodium nullum.

Specimen typicum fructiferum in Herb. Mich. legit *Percy Gentle*, no. 348, in Dist. Corozal, British Honduras, et specimina alia florentia prope San Andres, Corozal, British Honduras, no. 4750, et fructifera, no 528.

D. quasillarius is the "basket tie-tie" or "basket whist" of northern British Honduras.

Desmoncus uaxactunensis sp. nov.

Scandens maturitate 5–15 m. altus, caule vaginis tecto ca. 4–5 cm. crasso, nudato 2–3 cm. crasso. Folia caulem imbricate vaginantia. Vaginae sursum in ochream ca. 30 cm. longam, griseo-cinnamomeam furfuraceo-pubescentem, apice demum in fibros disolutam dense aciculis tenuibus atratis subascendentibus 4–18 mm. longis praeditam productae. Aciculae juventate fur-furaceae demum nitidae rectae ex papillis bulbiformibus orientes. Petioli para libera ca. 9–12 mm. lata 2 cm. longa et rhachis pars inferior colore vaginae similes furfuraceo-pubescentes aciculis quam eis vaginae brevioribus postice subsparsis antice densius positis obtectae Rhachis ca. 2.25 m. longa, foliolis utrinsecus ca. 25, infimis 25 cm. longis 2 cm. latis; mediis ca. 30 cm. longis 4 cm. latis; supremis ca. 35 cm. longis 4 cm. latis, omnibus utrinque concoloribus vel subtus pallidiusculis, proper margines vel glabratis vel evanescenter furfuraceo-pubescentibus, obscure subplicatis, basi angustatis replicatis apice acuminatis, ven media sola prominenti venis aliis longitudinalibusa equaliter evidentis supra cum venulis obliquis transversis subtus absque venulis transversis, supra prope basin aciculos ca. 10 graciles atratos 2 cm. longos vel breviores barbatim ferentibus etiamque 2 vel 3 alios in nervo medio infra mediam folii partem. Foliola irregulariter alternantia abrupte per solum 2 intermedia 18 cm. longa 18 mm. lata exacte foliacea sed retrorsa transeuntia in uncos 9-jugos subrigidos lateraliter compressos et applanatos non foliaceos, infimos 6 cm. longos, 15 cm. secus rhachin separatos, supremos 1–2 cm. longos, 1 cm. separatos. Cirrhus in extremitate solum modo uncis armatus, deorsum sparsissime spinis gracilibus 2 cm. longis armatus vel subinermis. Ramus fertilis infra spathas semicylindricus 10–13 mm. latus 35–40 cm. longus brunneo-lepidotus omnino in vagina occultus. Spatha inferior etiam semicylindrica, ca. 20 mm. lata, 40 cm. longa, facie plana interiore glabra, pallida, dense longitudinaliter venosa, facie concava tenuiter brunneo-lepidota, apice aperto angustata exfimbriata. Spatha superior fusiformis 28 mm. longa 4 cm. crassa furfuraceo-pubescens et dense

spinis atratis varie aggregatis in tuberculos sedentibus valde flexuosis vel rectis armata. Inflorescentia spatham superiorem non excedens. Pedunculi pars libera 5 cm. longa, 5 mm. crassa, lepidoto-furfuracea spinis 3–5 mm. longis tenuissimis ascendentibus tecta. Axis in parte inflorescentiae ramosa inermis, furfuraceus, 20 cm. longus, ramulos 40–50 floriferos simplices 4–12 cm. longos valde acute angulatim flexuosos ferens. Flores ad ramuli basin ternatim aggregati, ferior et centralis fertilis, staminei bini laterales. Fructus maturus ovoideus 15 mm. longus 12.5 mm. diametiens, minute apiculatus.

Specimen typicum in Herb. Univ. Mich. conservatum legit *H. H. Bartlett* in vicinitate oppidi Uaxactun Mayarum antiquorum, Petén, Guatemala, 18 Apr. 1931, no. 12576.

Desmoncus unaxactunensis differs from the closely related *D. chinantlensis* Liebm. most obviously in the much more slender and more sharply zigzagged branches of the fruiting inflorescence. Under a lens the prophyllum subtending the flower groups is seen to have a sharply triangular retrorse tip which is lacking in *D. chinantlensis*. The beard of slender spines on the base of the top of the lamina consists of a larger group of more closely placed spines. Doubtless other distinctions of flowers and fruit would be obvious if more complete material of *D. chinantlensis* were available for comparison.

Desmoncus ferox sp. nov.

Scandens gracilis, 2 cm. crassus, caule vaginis obtecto. Pars vaginae superior (ochrea) 25 cm. longa, apice demum in fibris dissoluta, sordide albida ferrugineo-furfuracea et dense armata, spiculis ca. 12–22 mm. longis, atris, gracilibus, juventate derosum pubescentibus, basi ex tuberculis cylindricis orientibus. Petioli pars libera 2–3 cm. longa Rhachis tenuiter ferrugineo-pubescens supra aciculis interdum 20–28 mm. longis armata subtus subinermis vel spiculis multum brevioribus praedita, ca. 2.5 m. longa, utrinque usque ad cirrhum (ca. 1 m. longum) foliolos ca. 24 ferens. Foliola inferiora ca. 30 cm. longa, 1.5 cm. lata longe attenuata in caudam filiformem 8 cm. longa; intermedia ca. 29 cm. longa 4 cm. lata, apice solum acuminata non filiformi-caudata; superiora ca. 36 cm. longa, 46 mm. lata acuminata sed sub lente bifida vel praemorsa; omnia longitudinaliter subplicata et venosa, utrinque sub lente tenuissime minutissimeque atro-pubescentia et transverse venulosa, subtus inermia, supra prope basin ferociter multiaciculata, aciculis longitudine eis vaginae rhachisque similibus interdum 30 mm. longis, utrinque acicula sola brevi (ca. 8 mm. longa) in vena media infra folioli medium instructa. Foliola in uncos transeuntia solum 2 subopposita, foliacea, 27 cm. longa, 12 mm. lata, basi uncis similiter tumida et reflexa. Uncorum paria 10, rigida, lateraliter compressa, inferiora 9 cm. longa 26 cm. inter se distantia, intermedia 4.5 cm. longa, 7 cm. distantia. Spatha inferior 22 mm. lata, pars clausa plus quam 21 cm. longa, pars aperta 13 cm. longa, sursum ferrugineo-furfuracea et mediocriter aciculata, aciculis de causa compressionis in vagina plerisque appressis sed prope orificium patentibus 7 mm. longis. Ramus fertilis infra spatham superiorem 11 mm. crassus, appresse et breviter aciculatus, ferrugineus. Spatha superior fusiformis, ca. 40 cm. longa, 3 cm. diametiens, cinnamomeo-albida et ferrugineo-furfuracea, apice breviter filiformi-caudata, deorsum appresse et breviter aciculata sursum valde horride patenter aciculata, aciculis

atratis, diverse directis, longioribus 18 mm. longis. Pedunculus ca. 7 cm. longus deorsum inermis sursum aciculatus, aciculis majoribus 13 mm. longis. Axis inflorescentiae pars ramosa ca. 24 cm. longa, inermis, albida et tenuiter ferrugineo-pubescens, ramos ca. 40 inferiores 15 cm. superiores 6 cm. longos simplices floriferos ferens, ramis (siccis) angulatis, valde angulatim flexuosis, deorsum flores sessiles ternatim sursum singulatim ferentibus. Flores feminei centrales inter 2 masculos siti depresso-globosi 3 mm. lati 2.5 mm. alti gamosepali gamopetali. Calyx subrotundus annulatus breviter margine 3-apiculatus symmetricus 3.3 mm. diam. Corolla cyathiformis margine constricta ovarium includens sessile breviter 3-stigmatosum. Staminodia nulla. Flores staminei calyce gamosepalo membranaceo symmetrico 3.5 mm. diametiente fere perfecte triangulo, angulis productis acuminatis, petalis 3 distinctis carnosis deltoideis, 8–10 mm. longis, acuminatis, basi 1.5–3.0 mm. latis, latioribus subcordatis. Stamina 9, sagittata, filamentis 1 mm. longis tenuissimis antheris profunde sagittatis gravidis 2 mm. longis, i.e. corolla occultis. Pistillodium nullum.

Specimen typicum ad oppidum Mayarum antiquorum Tikal lectum, Petén, Guatemala, *H. H. Bartlett* 12584, 12–15 Apr. 1931, in Herb. Mich.: La Libertad, Petén, Guatemala, *C. L. Lundell* 2646 (6 Apr. 1933; florens) et 3421 (27 Maiae 1933, cum fructibus).

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

THE GEOLOGICAL SOCIETY

518TH MEETING

The 518th meeting was held at the Cosmos Club October 31, 1934, Vice-President GOLDMAN presiding.

Informal communications: L. G. HENBEST showed lantern slides of pseudomorphs of halite from the De Queen limestone member of the Trinity formation, De Queen, Arkansas.

Program: W. T. SCHALLER: *Kramer borate deposits, California.* Discussed by Messrs. GOLDMAN, JOHNSTON, HENDRICKS, R. C. WELLS, GILLULY, HEWETT, and BAILEY.

R. C. WELLS: *The abundance of certain elements, especially radioactive elements, and related geologic problems.* The first attempt to compute the average chemical composition of known terrestrial matter was made by F. W. Clarke in 1889. Chemists have been adding to the compilation ever since. A recent publication by the Russian chemist A. E. Fersman lists the average abundance or scarcity, as the case may be, of 88 elements, and if account is taken of isotopes, there are now 262 species of matter to be considered. More elements occur in ten-thousandths of a percent than in any other rank of abundance. The radioactive elements have been of great aid in determining the abundance of several elements. These elements have pedigrees. Also, as they evolve heat continuously, there must be a definite limit to their quantity in the earth. They appear to be concentrated near the surface and hence it may be inferred that there is a similar limit to the abundance of elements generally associated with the radioactive elements in the earth's crust. Recent work in the Geological Survey has involved

more particularly the elements uranium, thorium, lead, tin, barium, columbium, tantalum, cesium, and rubidium. (*Author's abstract.*) Discussed by Messrs MERTIE and WASHBURNE.

519TH MEETING

The 519th meeting was held at the Cosmos Club November 14, 1934, Vice-President GOLDMAN presiding.

Informal communications: GEORGE TUNELL told of his visit, during the summer, to laboratories engaged in crystallographic work in Oslo, Stockholm, Helsingfors, Leningrad, and Moscow.

D. F. HEWETT described a manganese depositing hot spring at Hot Springs, Arkansas.

Program: W. P. WOODRING: *Geomorphology of the Palos Verdes Hills, California.* Discussed by Messrs. BRADLEY, HESS, ALDEN, and COOKE.

H. T. STEARNS: *The geologic history of Oahu (Hawaiian Islands).*

Oahu consists of two dissected volcanoes known as the Koolau and Waianae Ranges. The sequence of events in the geologic history of Oahu is summarized as follows:

TERTIARY TIME

1. Building of a dome-shaped island about 3,000 feet high by the extrusion of the lower basalt member of the Waianae volcanic series from southeast and northwest rifts with the center of activity at their intersection near the present site of Kolekole Pass. Extrusion of basalt of the Kailua volcanic series from a rift passing through the site of the present Mokulua Islands forming another island at about the same time. 2. Collapse of the Waianae dome and extrusion of the middle basalt member from the Waianae rifts. The cliffs formed by the collapse ponded the middle basalt and forced most of it to flow north and east. Beginning of erosion to the west of these cliffs, starting the valleys of Nanakuli, Lualualei, Waianae, Makaha, Keaau, and Makua. Shift of volcanic activity a mile south of the Kailua rift with the extrusion of the older layers in the Koolau volcanic series probably about this time. 3. Extrusion of the upper lavas of the Waianae volcanic series and continued erosion of the valleys named above. The main bulk of the Koolau series was probably extruded at this time. 4. Extinction of the Waianae Volcano and the beginning of erosion all over it. Continued extravasation of lava from the Koolau Volcano. 5. Overlapping of the Waianae dome by lavas from the Koolau Volcano resulting in the partial filling of its windward valleys and the joining of the two volcanoes to form a single island. Continued erosion of the leeward side of the Waianae dome.

EARLY (?) PLEISTOCENE TIME

6. Cessation of activity of the Koolau Volcano. Continued erosion of the Waianae dome. 7. Long cycle of erosion resulting in the sweeping away by streams of most of the windward side of the Koolau and part of the leeward side of the Waianae domes. High cliffs formed on the end of interstream divides by marine abrasion. Coral reefs started growing about this time if not before. 8. Gradual submergence of Oahu by more than 1,200 feet resulting in the drowning and sedimentation of the valleys and the formation of the Koolau Pali by the partial burial of interstream divides of large amphitheatre-headed valleys. Continued marine abrasion on exposed headlands and growth of coral reefs.

MIDDLE (?) AND LATE PLEISTOCENE TIME

9. A halt of the sea at 55 feet above present sea level known as the Kahuku stand. 10. Recession of the sea probably about 300 feet below present sea level, known as the Kahipa stand. Erosion of the coastal plain deposits. 11. Rise of the sea to 95 feet above present level known as the Kaena stand, extrusion of some of the Honolulu volcanics, vigorous growth of coral reef off shore, and grading of valley floors to this level. 12. Recession of the sea to 70 feet above present level, known as the Laie stand, more eruptions of the Honolulu volcanics, growth of coral reef off shore, and erosion continued. 13. Halt of the sea at the 40-foot (?) level known as the Waialae stand. 14. Recession of the sea to about 60 feet below the present level known as the Waipio stand, additional eruptions of the Honolulu volcanics, dissection of coastal deposits, vigorous wave attack on headlands, and probably inhibition of coral growth. 15. Rise of the sea to about 25 feet above the present level known as the Waimanalo stand, further eruptions of the Honolulu volcanics, drowning of the mouths of valleys, continued erosion of coastal deposits above the 25-foot level, and growth of coral off shore.

LATEST PLEISTOCENE OR RECENT TIME

16. Recession of the sea to the present level. Koko Fissure and Tantalus-Sugar Loaf eruptions, continued erosion, and probably slowing down in rate of growth of coral off shore. (*Author's abstract.*) Discussed by Messrs. STEPHENSON and ALDEN.

520TH MEETING

The 520th meeting was held at the Cosmos Club November 28, 1934, Vice-President SCHALLER presiding.

Informal communications: Miss M. D. FOSTER displayed a map showing the distribution in the United States of the disease known as "mottled teeth." The endemic areas do not coincide with areas of known fluorspar deposits. In Arizona, ground water containing 1 to 2 parts per million of fluoride causes mild cases, and over 2 parts per million severe cases.

Program: Miss A. I. JONAS: *Pre-Devonian structural zones in Scotland and eastern North America.* Discussed by Mr. GILLULY.

G. W. STOSE: *Comparison of Cambrian section in Northwest Scotland with that of the Northern Appalachians.* Discussed by Miss JONAS and Messrs. MERTIE and RUBEY.

T. L. KESLER: *Granitic injection processes in the Columbia quadrangle, South Carolina.*

Older rocks of the eastern "slate belt" have been intruded by a biotite granite. Northward these older rocks were traced almost continuously into North Carolina where detailed study in several localities has proved them to consist mainly of rhyolitic and andesitic tuffs and breccias with interlayered flows and sills. Southwestward from the quadrangle, the belt was traced farther into Saluda County where its original character is well preserved. The "slate belt" has been altered throughout most of the quadrangle, though original bedding may be frequently recognized. Normal strike averages about N. 55 E. except where deflected by granite masses and dips are steeply N. W. except for local reversals considered to be of little structural significance.

The granite has caused recrystallization parallel to bedding in wide areas of the older rocks where bedding may still be recognized. This is

believed to be due to the ascension of magmatic emanations along the convenient steep dip. It was suggested that the general schistose condition of the older rocks may be thus explained with the development of sericite, biotite, chlorite, and hornblende oriented with their long axes parallel to bedding. Recrystallization is wide-spread, and is believed to indicate a general subjacent source of which the isolated granite masses are satellites. In comparative proximity to these masses, the schists have been subjected to litpar-lit injection and replacement by granitic material. Still nearer the granite, an advanced stage of injection is expressed by granitic rocking which the structure of the older rock is preserved through inheritance of parallel platy ribbons of biotite or the linear arrangement of hornblende. Where the process has been carried to an extreme, replacement and recrystallization have obliterated most of the inherited structure, but the resulting granitic rock contains traces of the older rocks. (*Author's abstract.*) Discussed by Miss JONAS and Messrs. JOHNSTON, CARL BROWN, GILLULY, LOUGHLIN, STOSE, and CURRIER.

521ST MEETING

The 521st meeting was held at the Cosmos Club December 12, 1934, Vice-President GOLDMAN presiding. N. H. DARTON presented a deferred presidential address: *Erosion plans and overlaps in the eastern Maryland region.*

42D ANNUAL MEETING

The 42nd annual meeting was held at the Cosmos Club ofter the adjournment of the 521st regular meeting, Vice-President GOLDMAN presiding. The annual report of the Secretaries was read. The Treasurer presented his annual report showing an excess of assets over liabilities of $1443.38 on December 8, 1934. The auditing committee commended the Treasurer on the condition of his books.

The results of balloting for officers for the ensuing year were as follows: *President:* W. T. SCHALLER; *Vice-Presidents:* M. I. GOLDMAN and H. D. MISER; *Treasurer:* C. WYTHE COOKE; *Secretaries:* W. D. JOHNSTON, Jr., and GEORGE TUNELL; *Members at large of the Council:* A. A. BAKER, C. L. GAZIN, R. M. LEGGETTE, S. W. LOHMAN, and J. S. WILLIAMS; *Nominee as Vice-President of the Washington Academy of Sciences representing the Geological Society:* H. G. FERGUSON.

T. B. NOLAN and W. D. JOHNSTON, Jr., *Secretaries.*

BOTANICAL SOCIETY

254TH MEETING

The 254th regular meeting was held in the Assembly Hall of the Cosmos Club, January 2, 1934, President SMITH presiding; attendance 103. DOROTHY BLAISDELL, MARIE CLARK, BOWEN CRANDALL, and ARTHUR C. FOSTER were elected to membership.

Notes and reviews: DAVID GRIFFITHS reviewed *The fantastic clan* by Thornber and Bouker, a naturalist's treatment of the cactus family. H. B. HUMPHREY called attention to a new book, *William Bartram, the interpreter of the American landscape,* by N. Bryllion Fagin.

Program: ANNIE M. HURD KARRER: *Selenium injury to wheat and its inhibition by sulphur.*—A so-called alkali disease of livestock in certain re-

stricted areas of the Northern Great Plains area has been traced to the presence of selenium in the vegetation. The grain and straw of wheat plants grown in soil at Arlington Farm to which only 1 part per million selenium was added as sodium selenate gave no external evidence of having been affected by the selenium, but were extremely toxic to experimental animals. In order to produce visible symptoms of injury to the plants the selenium concentration in the soil had to be increased to between 10 and 20 parts per million.

The characteristic symptom of injury is a snow-white chlorosis of the young leaves. With extreme injury the entire leaf may be white, maintaining its normal turgidity for some time before withering. More often the tip of the leaf remains green, as does the midvein. A striking symptom occurring sporadically in the selenized seedlings of both wheat and corn was a pink coloration on the chlorotic parts of the leaves. When the selenate was added to pots containing older plants the white chlorosis appeared only on leaves emerging subsequent to the addition of selenium, those already formed merely turning yellow if the selenium concentration was high enough to affect them at all.

The toxicity of sodium selenate for wheat grown in sand and water cultures varied inversely with the amount of sulphur, as magnesium and ammonium sulphate, in the nutrient solution. In water cultures selenium concentrations of 1 p.p.m. are fatal after a few weeks in nutrient solutions made up without sulphate whereas 96 p.p.m. were required for this degree of injury in solutions containing 192 p.p.m. sulphur. There was no visible selenium injury in any solution where the proportion of selenium to sulphur was 1:12 or less, whereas chlorosis was marked in all where the ratio was 1:8 or greater. The point of minimum detectable injury was between 1:9 and 1:11 in all the experiments. In soils, selenium injury was always inhibited by the addition of excess sulphur either as calcium, magnesium, potassium, or ammonium sulphate, or as elemental sulphur. The amount required for a given addition of selenate varied with the latter's toxicity in the particular soil. (*Author's abstract.*)

CHARLES THOM: *An endomycete parasitic to man.*—Histoplasmosis was described by Darling as due to an intracellular parasite, *Histoplasma capsulatum*, apparently unicellular and protozoan in character. The organism isolated by DeMonbreun from a case of histoplasmosis grew in ordinary cultures as a mold, which was found to belong in or near the Endomycetaceae. Ascospores were not found, but chlamydospores characteristic in shape and markings were interpreted as morphologically analogous to asci. The parasite thus falls in a broad group which includes such species as *Coccidioides immitis*. The organism as described presents a unique type of chlamydospore, which will insure its recognition when isolated from future cases. (*Author's abstract.*)

VERA K. CHARLES: *Microsporum of the cat causing ringworm in man.*—Published in full in this JOURNAL **24**: 222–227. 1934.

255TH MEETING

The 255th regular meeting was held in the Assembly Hall of the Cosmos Club, February 6, 1934, President SMITH presiding; attendance 65.

Program: A. S. HITCHCOCK: *Taxonomy as a fundamental factor in botanical research.*—All comparative scientific research should be based upon definitely known material, and this principle applies emphatically to botanical research. Taxonomy is fundamentally related to botany in the same sense

that arithemetic is fundamental to other branches of mathematics. Much confusion has resulted, often involving much expense and waste effort, because of failure to secure accurate identifications of sources of drugs, fibers, and other economic plants. Discussed by Messrs. SWINGLE and WAITE

AGNES CHASE: *Some seeds caught in the upper air.*—Seeds taken in insect traps released at different altitudes from an airplane were sent to the Department of Agriculture for study. More than half were those of grasses, for the most part *Paspalum urvillei* and *P. dilatatum.* Of 30 collections, made at from 200 to 5,000 ft., all included spikelets of the first species and about half included the latter species as well. One collection each of *P. pubiflorum* and *Hordeum pusillum* were obtained. Discussed by Messrs. NORTON, THONE and DIEHL.

E. B. LAMBERT: *Climatic phases in the ecology of the compost heap.*—Gas samples taken from all parts of mushroom compost heaps indicate an increase of carbon dioxide and decrease of oxygen toward the lower central part of the heap. In flat heaps three feet deep anaerobic conditions are usually found in areas deeper than one foot and more than three feet from the side of the heap. The highest temperatures (160° to 180° F.) are usually confined to a region two to four feet from the sides of the heap and one foot to three feet from the top. The outer layers are cooler because of the lack of insulation from the outside and the lower central region is cooler because the lack of oxygen retards the microbial activity. At ground level, temperatures (100° to 120° F.) are usually lower than in the higher strata, presumably also because of lack of oxygen. A more uniform distribution of oxygen and wider distribution of the high temperature region is induced by placing ventilating tiles at ground level. In all probability conditions such as these influence the suitability of the finished compost for mushroom culture by establishing the trend of the microbial and insect population of the conpost heap. (*Author's abstract.*) Discussed by Mr. WAITE.

256TH MEETING

The 256th regular meeting was held in the Assembly Hall of the Cosmos Club, March 6, 1934, President SMITH presiding; attendance 85. RALPH C. STAEBNER was elected to membership.

Notes and reviews: M. B. WAITE discussed low temperature injury to peach buds and exhibited a branch of *Ligustrum lucidum,* showing characteristic recovery from freezing injury. W. T. SWINGLE discussed an introduction of date palms from Persia into the United States in 1818, some of which still survive in the sea islands of Georgia.

Program: M. L. BOMHARD: *Recent palm discoveries in Louisiana.*—More than 25 species of palms are cultivated successfully in Louisiana, the most extensive plantings being in the southern part of the State, particularly around New Orleans. The hardy species most frequently cultivated include *Washingtonia robusta, W. filifera, Phoenix canariensis, P. dactylifera, Livistona chinensis, Butia capitata* and its relatives (known "to the trade" as types of *Cocos australis*) including some that have edible fruits, *Trachycarpus excelsa, Chamaerops humulis,* and *Sabal palmetto.* Other species which are well adapted to the lower part of the State, but which are not yet so widely planted as those just listed include *Sabal exul, S. blackburniana, S. causiarum, S. texana, Rhapis excelsa, Rhapidophyllum hystrix, Phoenix reclinata, P. sylvestris, Acrocomia totai,* and *Erythea armata.* All of these, with the exception of *Erythea armata* which flowers only in occasional years, regularly flower and fruit annually, at least in the New Orleans vicinity. A

35-year old specimen of *Phoenix rupicola* may be seen outdoors in New Orleans, but it is given protection during cold weather. The coconut palm, *Cocos nucifera*, and the Royal palm, *Roystonea regia*, have not been grown successfully for periods of more than a few years. *Cocos plumosa* (*Arecastrum romanzoffianum*) is no longer cultivated outdoors in New Orleans, but it may be seen in the orange-country fifty miles to the south.

The town of Monroe in Northeastern Louisiana, where the winters are sometimes severe, achieves a striking tropical effect through extensive plantings of one of the hardiest of palms, *Trachycarpus excelsa*. There are a great many more specimens of the true date palm, *Phoenix dactylifera*, growing in the southern part of the state than most persons realize. These trees flower annually and edible fruits are produced, including some excellent seedless forms. (*Author's abstract.*)

LOREN G. POLHAMUS: *Goldenrod and rubber.*—Following Edison's discovery that goldenrod contains rubber the cultivation and propagation of species of goldenrod have been studied. Variations in growth habit have been found and the possibility of selection on vegetative characters has been demonstrated, but no correlation has been found between growth character and rubber content. Studies have shown that variations in soil and climate affect the rubber content. Outstanding species from the standpoint of rubber content are *Solidago leavenworthii*, *S. edisoniana*, *S. altissima*, *S. serotina*, *S. fistulosa*, *S. nashii* and *S. sempervirens*. It has been found possible to propagate goldenrod readily by means of the underground stolons, as many as 500 new plants having been obtained from a single plant of *S. leavenworthii* in one year. Stem cuttings have failed to root but it has been found possible to propagate several species freely by layering. (*Author's abstract.*)

J. I. LAURITZEN and R. T. BALCH: *Influence of environmental factors on inversion of sucrose in harvested cane.*—The results from experiments conducted during the grinding season: 1930–31, 1931–32, and 1932–33 in Louisiana showed very little inversion of sucrose in sugarcane kept wet by sprinkling irrespective of the variety used. There was less loss of sucrose through inversion during rainy than during dry weather. There was an intimate relation between the loss of moisture and inversion of sucrose; the greater the rate of loss of moisture the greater the proportionate rate of inversion. By adding moisture to cane in which inversion was proceeding rapidly as a result of drying during various periods of time, inversion of sucrose was checked. In cane kept wet during storage at temperatures of 45°, 55°, 65°, and 75° F., very little inversion of sucrose occurred and the amount was similar at each of the temperatures. Among the commercial varieties of sugarcane grown in Louisiana Co. 281 showed the greatest resistance to inversion of sucrose; P.O.J. 36M, and C.P. 807 the least, with P.O.J. 213, P.O.J. 234, Co. 290 ranging between these extremes. No chemical or physiological changes took place during storage that were inimical to sugar manufacture. (*Authors' abstract.*)

257TH MEETING

The 257th regular meeting and annual dinner was held in the ballroom of the Kennedy-Warren, April 3, 1934, President SMITH presiding; attendance 142.

Program: ORAN RABER: *Teaching botany and botanizing around the world on a floating university.*

258TH MEETING

The 258th regular meeting was held in the Assembly Hall of the Cosmos Club, May 1, 1934, President SMITH presiding; attendance 90. H. P. BARSS, F. A. MCCLURE, JOHN MONTEITH, JR., and LOREN G. POLHAMUS were elected to membership.

Notes and reviews: M. B. WAITE discussed the life history of the large red oak trees formerly lining 12th St., S.W., noting particularly evidence of injury from the extraordinary cold weather of 1899, and the slow growth since the advent of paved streets. H. B. HUMPHREY presented a summary of the precipitation in Washington for the period January 1930 to April 1934, emphasizing the deficiency of 17 inches for the period. J. B. S. NORTON discussed the effect of altitude on opening English elm buds. F. WEISS exhibited greenhouse grown Ixias and called attention to the suitability of this plant for outdoor culture.

Program: A. E. LONGLEY: *The chromosomes of maize.*

F. V. COVILLE: *The Death Valley of California after forty years.*

259TH MEETING

The 259th regular meeting was held in the Assembly Hall of the Cosmos Club, October 2, 1934, President SMITH presiding; attendance 73.

Notes and reviews: A. S. HITCHCOCK reviewed Agnes Arber's new book *The Gramineae.* M. B. WAITE discussed the effects of prolonged and excessive rainfall with high humidity during the record-breaking September with especial reference to the curing of tobacco in Maryland. W. T. SWINGLE reviewed the classical work on horticulture and botany of Brazil, edited by M. Pio Correa, *Diccionaire das Plantas Uteis do Brasil et das exoticas Cultivados.*

A. A. BITANCOURT, subdirector, Instituto Biologico, Sao Paulo, Brazil, made a brief address in response to the welcome extended to him by the President on behalf of the Botanical Society. J. A. STEVENSON exhibited some of Mr. Bitancourt's publications on Citrus diseases.

Program: L. H. FLINT: *Sensitivity of dormant lettuce seed to light and temperature.*—In typical cases of seed dormancy internal processes are effective after a longer or shorter period in overcoming the seemingly inanimate state without special agencies. In the case of lettuce seed which appears subject to classification as dormant, however, it has been found that light is a factor promoting germination. The sensitivity of such lettuce seed to light a few hours after soaking in water is so great that a few seconds' exposure to sunlight is sufficient to insure germination in subsequent darkness at 20° C. This sensitivity is thus comparable with that of photographic film.

It has been found that the longer wave-lengths of visible light, ranging in length from about 5200 to about 7000 Å and characterizing yellow, orange and red light, are effective in promoting germination. The shorter wave-lengths of visible light, ranging from about 5200 to about 4000 Å and characterizing green, blue and violet light, have been found to be effective in inhibiting germination. Seeds exposed to red light for a time sufficient to insure subsequent germination in darkness would not germinate in blue light.

The role of temperature in relation to light-sensitivity in dormant lettuce seed was studied by soaking seeds in water at various periods and then exposing each lot to a uniform illumination. All seeds were put in a moist

chamber at 20° C. following this illumination. The results obtained indicated that whereas at 5° C. the sensitivity of the seed to light was maintained for several weeks, at 25° C. the sensitivity was so altered after 24 hours that the standard illumination was without appreciable effect. This relationship may account for some of the beneficial effects ascribed to soaking seed at low temperatures.

The establishment of a definite inhibitory effect of certain wave-lengths of light on germination appears of added significance because of the fact that these same inhibiting rays have been found to be the ones effecting the phototropic response of green plants. The results thus emphasize the viewpoint that green plants turn toward light of specified wave-lengths not because they could thereby utilize more illumination, but rather because the light inhibited growth on the side of the stem directly exposed to the light. (*Author's abstract.*)

E. H. WALKER: *Some problems and methods in the taxonomy of Chinese plants.*

260TH MEETING

The 260th regular meeting was held in the Assembly Hall of the Cosmos Club, November 6, 1934, President SMITH presiding; attendance 72.

Notes and reviews: F. THONE exhibited *Wild flowers* by Homer D. House a work similar to *The Wild Flowers of New York* issued some years ago by the New York State Museum.

L. H. BAILEY was present as a guest and, after being welcomed by the President, addressed the Society informally. He gave a synopsis of recent botanical history contemporaneous with his own career, expressing judgment on present botanical work and forecasting the future. He referred to his college days under the tutelage of Asa Gray, his service as professor of horticulture "in spite of which he remained a botanist," his term as Dean of the New York State College of Agriculture. He spoke of the enthusiasm of the older botanists and naturalists for their work. He urged the importance of knowing the habits and range of variation of plants in the field. In discussing evolution, he said that we must get back to nature; as yet we can not apply the discoveries of the laboratory to influencing the course of evolution. In commendation of present-day taxonomy, Dr. Bailey spoke of the attention now given to the proper collection of specimens, and in determining the variation and the range of species; he especially recommended the care and completeness shown in modern taxonomic descriptions.

Program: EARL S. JOHNSTON: *Wave-length effects of light on phototropism.*—Experiments on the evaluation of the wave-length of light in its effect on phototropism were carried out, using an improved plant photometer. Oat seedlings were grown between two lights, one standard, the other of a restricted wave-length range. The intensity of the standard was adjusted until seedlings showed no phototropic bending. At such balance points the intensity ratios of one light to the other were determined. The phototropic sensitivity curve rose from 4100 A to a maximum at 4400 A. It then dropped off to a minimum at about 4575 A and again rose to a secondary maximum in the region 4700 to 4800 A. The fall was quite rapid from this point to 5000 A, from where it tapered off very gradually to the threshold on the long wave-length side at about 5461 A.

C. F. ANDRUS: *Cell and nuclear behavior in Ceratostomella and certain other fungi.*—A discussion of cell multiplication and nuclear behavior in the ascus of the species of *Ceratostomella* and *Endoconidiophora*, with some review of

chromosome number and reduction in other Ascomycetes. Various types of direct and indirect cell cleavage that occur previous to ascus formation in *C. moniliformis* were described. The crosier type of cell division is modified to conform to the detached and unwalled condition of the dividing protoplast. Changes in cell shape accompanying cell division were emphasized. A description of nuclear divisions in the ascus included remarks on chromosome structure and number. The vesiculate nature of the spore-producing region of the ascus and the manner of ascospore formation in *C moniliformis* and *C. fimbriata* seem to distinguish the group from more familiar genera of the Ascomycetae. (*Author's abstract*).

261ST MEETING

The 261st meeting was held in the Assembly Hall of the Cosmos Club, December 4, 1934, President SMITH presiding; attendance 50.

Program: N. R. SMITH: *Present trends in soil bacteriological research.* (Address of retiring President).

34TH ANNUAL MEETING

The 34th Annual Meeting was held immediately following the adjournment of the 261st meeting. The recording secretary reported that the Society closed the year with an active membership of 206 and an honorary membership of 4. The names of 8 members had been placed on the absentee list because of temporary absence from the city. The Society lost two members by death, H. C. SKEELS and KARL KELLERMAN. Twelve new members were elected; three members retired from professional work and were elected to honorary membership under the terms of the By-laws: Miss MARY K. BRYAN, Dr. WM. TAYLOR and Mr. C. O. TOWNSEND.

The following officers were elected to serve for the ensuing year: President, W. W. DIEHL; Vice-President, FREEMAN WEISS; Recording secretary, CHAS. T. SWINGLE; Corresponding secretary, NELLIE A. BROWN; Treasurer, NELLIE W. NANCE; N. R. SMITH was nominated as vice-president for the Botanical Society to the Washington Academy of Sciences.

Freeman Weiss, *Recording Secretary.*

SCIENTIFIC NOTES AND NEWS

Prepared by Science Service

NOTES

The Midwinter Meetings.—Washington science was well represented at the various midwinter meetings, especially those of the American Association for the Advancement of Science and affiliated societies at Pittsburgh. The principal address, at the first formal meeting on Thursday evening, December 27, was delivered by Dr. WILLIAM A. WHITE, superintendent of St. Elizabeth's Hospital, on the subject, *Man, the great integrator.* On Friday afternoon, December 29, an illustrated lecture was presented by W. R. CHAPLINE, chief, range research, U. S. Forest Service, on *Forestry fosters new approach to watershed conservation.* Many scientists from Government departments, research institutions and the several universities in the District of Columbia presented papers before the various section and society meetings.

In the exhibit hall, six Washington institutions had displays illustrating some of their many activities. The American Association for the Advance-

ment of Science itself had an exhibit showing various phases of its work in encouraging the development of science, and also giving information on plans for future meetings. Exhibits sponsored by members of the Smithsonian Institution included a model of a solar heating apparatus, a demonstration of the work of the Laboratory of Radiation and Organisms, and a display of lepidoptera. The exhibit of the Carnegie Institution of Washington was devoted to the recent rapid developments in the fields of genetics and embryology, particularly in the field of chromosome topography and gene mapping. The National Bureau of Standards demonstrated work done on deuterium or *heavy hydrogen*, and also displayed a set of new resistance standards. The U. S. Bureau of Mines set forth work done along five separate lines of research on coal and other minerals. The National Geographic Society's exhibit consisted of models and the stratosphere balloon and apparatus used in their joint exploration flight with the U. S. Army Air Corps last summer.

Of special interest at the Annual Science Exhibition of the American Association for the Advancement of Science was an exhibit of research on deuterium and its compounds by laboratories which have been principal contributors in this field of investigation. In this exhibit covering the fields of physics, chemistry, and biology, 13 laboratories were represented, 6 of these having major sized exhibits.

Other midwinter meetings in which Washington scientists participated included those of the Geological Society of America (New York), the Society of American Bacteriologists (Chicago), the Archaeological Institute (Toronto), the American Astronomical Society (Philadelphia), the Chemical Engineering Symposium on Distillation (Cambridge), and the American Historical Association.

Science Advisory Board.—Broad scientific foundations are being sought by the Government, for its future policies of land use. In this search scientists on the Land Use Committee of the Science Advisory Board are taking an active part.

The Land Use Committee acted as a sort of informal liaison organization, enabling fifteen separate government agencies concerned with different aspects of land use to pool their knowledge and obtain an approach to the problem as a whole.

The Committee employed Dr. CARL O. SAUER of the University of California, to make a comprehensive study of the subject as it is known in this country at present. With Dr. SAUER was associated W. L. G. JOERG of the American Geographical Society.

Outstanding on the agenda of problems recommended for first-order investigation is a refinement of studies of climatological records already in existence, to give more reliable bases for decisions as to the habitability of marginal and submarginal lands. If such lands, still in the public domain or now in process of re-purchase, can be withheld from re-settlement when they do not give reasonable promise of yielding a living, repetition of the tragedies of recent drought, and the older ones of the *grasshopper years* of the last century, can be spared the nation.

Important also is the project for a study of permanent natural means of checking soil erosion. At present, major effort is being bent to the construction of gulley dams, partly because the situation in many localities is desperate enough to require engineering works to help it, partly in order to supply jobs for unemployed men. But in the long run, erosion must be held

in check by the roots of grasses, bushes and trees; and it is one of the objectives of contemplated study to find the right species and develop the right planting methods.

National Resources Board.—The National Resources Board has issued a series of reports, on the relation of public works to land and water resources, on land planning, on water planning, on mineral policy, and on a national mapping plan. Reversal of the traditional method of land development is advocated in the land planning report; it calls for the reabsorption into public domain of much land now badly settled and socially expensive, greater care in the release of lands for future settlement, and social control over private transactions in real estate. The necessity for erosion control is also emphasized. In the mineral resources report, stress is lid on the desirability of *holding back* in the use of such minerals as exist in this country in insufficient quantities for normal needs, and at the same time controlling the exploitation of deposits where present surpluses exist. Studies of tariff readjustments and foreign trade agreements as they affect mineral resources are also recommended. The mapping report calls for a ten-year plan to complete the topographic survey of the United States. Only 26 per cent of the total area of the United States exclusive of Alaska and island possessions has been adequately mapped; the rest is mapped either inadequately or not at all. The working program proposes zones of first, second and third priority, based on the urgency of the need for completion. The National Resources Board functions under the chairmanship of Secretary ICKES; its personnel includes Secretaries DERN, WALLACE, ROPER and PERKINS, Relief Administrator HOPKINS, FREDERIC A. DELANO, CHARLES E. MERRIAM and WESLEY C. MITCHELL.

National Bureau of Standards.—A new method for investigating the effects of radium rays and X-rays in deep tissues has been developed at the National Bureau of Standards by L. S. TAYLOR. It stimulates conditions in the human body with wax blocks, which have been named "phantom bodies," and a mixture of carbon bisulphide, tetrahydronaphthalene and ligroin to serve as the radiation-absorbing fluid. An ionization screen, immersed in the fluid, obtains a measure of the degree of ionization caused by the radiations. With further development the instrument may prove of great value in determining the nature and dosage of radiations to be used in treating deep-seated tumors.

Smithsonian Institution.—Thirty ancient Indian village sites and numerous island graveyards along the lower Columbia river have been explored by HERBERT W. KRIEGER, who returned to Washington in January, after six months in the field. The expedition was undertaken in order to salvage archaeological data and material in the area which will be flooded upon the completion of the Bonneville Dam. The region proves to have been thickly settled. In one area, now arid and unpopulated, Dr. KRIEGER counted the remains of more than five hundred houses. One island cemetery, he learned, had been burned by early white settlers; here he found evidences of fire intense enough to fuse glass beads.

U. S. National Park Service.—Reports of measurements made of glaciers in national parks this past fall by Park Naturalists indicate continued recession. In each instance glaciers were found to have moved and melted back from ten to fifty feet or more.

Geological Survey.—A contract was awarded the Fairchild Aërial Surveys, Incorporated, for furnishing aërial photographs, to be taken with a single-lens camera, of about 5,800 square miles in South Carolina. The photographs will be used to supplement ground surveys for topographic mapping provided for in the Public Works program of topographic surveys.

The possibilities of langbeinite, a potassium-magnesium sulphate identified in certain drill cores from Federal land and private land in New Mexico, as an important fertilizer material, are receiving considerable industrial attention at this time. As this mineral is slowly soluble, it is believed suitable for direct application with the seed, in lieu of the customary application of potash fertilizer at the side of the seed row, and offers advantages in the reduced amount of fertilizer required and in the longer period that the potash remains available to the plant during the growing season.

News Briefs

The Bureau of Mines has awarded contracts for the drilling of a new gas well on the helium-bearing Cliffside structure, in Potter County, Texas, which is expected to bring in a material increase in the Government's available helium supply.

The U. S. Army Air Corps and the National Geographic Society will undertake another stratosphere balloon flight this spring, it is announced.

A precision cosmic-ray meter, has been installed at the Cheltenham Magnetic Observatory by Dr. Richard L. Doan, Dr. A. H. Compton's assisttant at the University of Chicago, S. E. Forbush of the Department of Terrestrial Magnetism, and George Hartnell of the U. S. Coast and Geodetic Survey, during the first week in January and is now in operation.

Personal Items

By action of the Trustees of the Carnegie Institution of Washington at their annual meeting in December, Dr. John A. Fleming was made Director of its Department of Terrestrial Magnetism beginning January 1.

Dr. Hugh L. Dryden has been promoted to the position of chief of the division of mechanics and sound of the National Bureau of Standards.